DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
LIMITED SCOPE PROJECT CONCEPT REPORT

Project Type:	Operational Improvement	P.I. Number:	0013961
GDOT District:	7	County:	Cobb
Federal Route Number:	41 and I-285	State Route Number:	SR 3 and 407
	Project Number:	*NA*	

This concept report was drafted and approved by Cobb County and includes extending Cobb Parkway to I-285 WB exit ramp, providing a free flowing right turn lane on the I-285 exit ramp, adding NB left turn lane on Cobb Parkway at Spring Road, and increasing the radius on Circle 75 to include a free flowing lane.

Submitted for approval:

State Traffic Engineer — Date: 10/22/15

Sue Anne Decker — 10.8.15
GDOT Project Manager — Date

Approval:

Approve: Margaret B. Pirkle — 10.27.15
GDOT Chief Engineer — DATE

P.I. Number: 0013961

LIST OF ATTACHMENTS/SUPPORTING DATA

1. Cobb County Approved Concept Report

DEPARTMENT OF TRANSPORTATION
COBB COUNTY, GEORGIA
PROJECT CONCEPT REPORT

Project Number: X2403

Project Name: Intersection Improvements to US 41/Cobb Parkway at Spring Road/Circle 75 Parkway and US 41/Cobb Parkway at the I-285 Westbound Exit Ramp

Federal Route Numbers: US 41, I-285 State Route Numbers: SR 3, SR 407

Recommend for Approval:_____ DATE 10/7/2015

Tim Matthews, P.E. – Consultant Project Manager

Recommend for Approval:_____ DATE_____

James Hudgins, P.E. – Project Manager

Recommend for Approval:_____ DATE_____

David Montanye, P.E. -- Traffic Operations Division Manager

Recommend for Approval:_____ DATE_____

Michael Francis, P.E. – Preconstruction Engineer

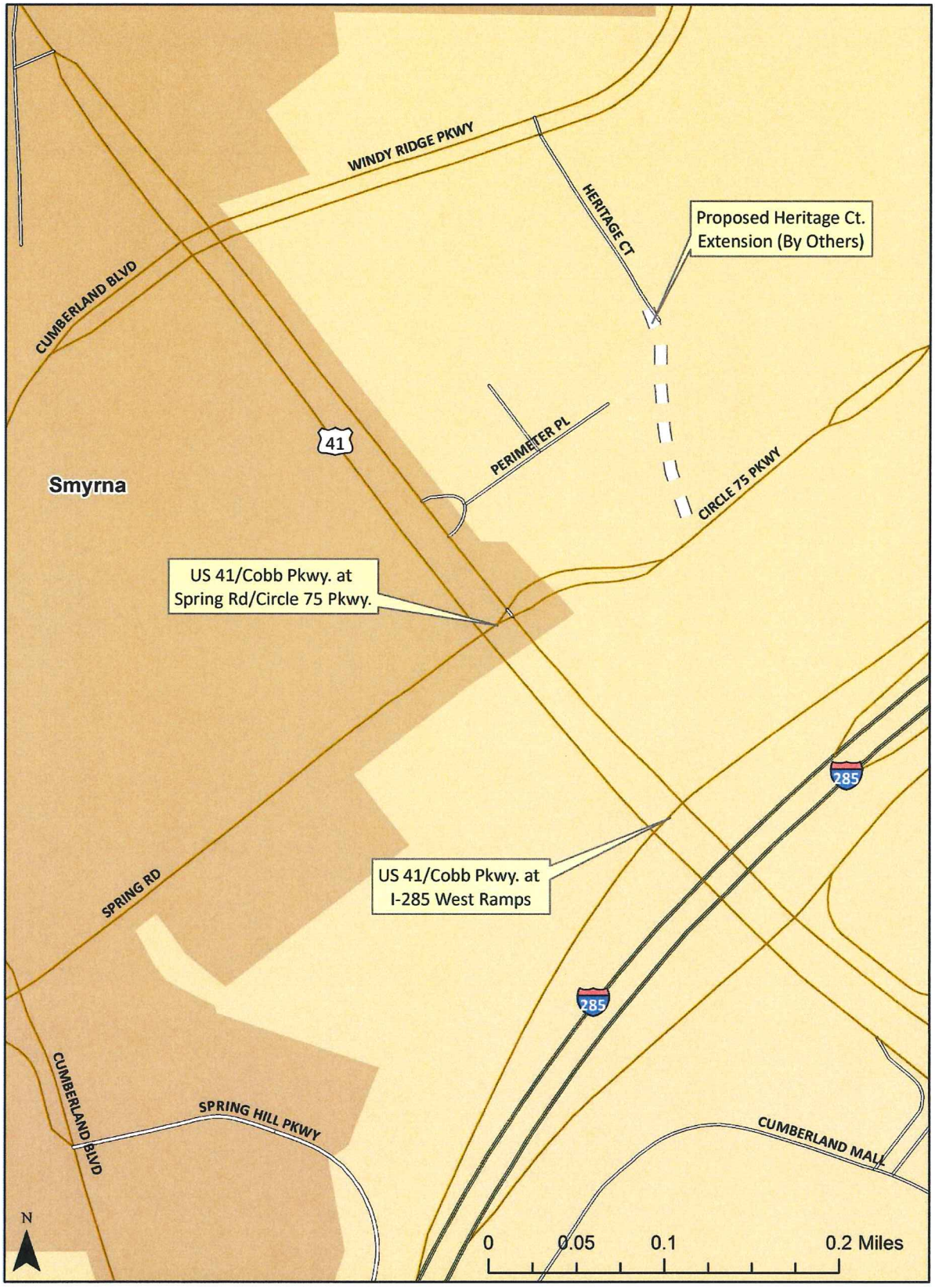
Approve: _____ DATE_____

Chris Pruitt, P.E. – Transportation Division Manager

Approve: _____ DATE_____

James A. Wilgus, P.E. – Deputy Director

PROJECT LOCATION MAP



PLANNING AND BACKGROUND

Need and Purpose: The intersections of US 41/Cobb Parkway and the I-285 West off-ramps and Spring Road/Circle 75 Parkway are critical intersections in the Cumberland area. Over 40,000 vehicles per day (vpd) travel along Cobb Parkway in this area while Spring Road, which serves as a primary connection between the city of Smyrna and I-285, has over 34,000 vpd. The intersections currently suffer from congestion during peak hours, including weekends, for several reasons such as the arterial nature of Cobb Parkway, the densely commercial Cumberland area to the southeast, limited capacity for high-volume turning movements, and the intersections' general proximity to I-285. In addition to the existing contributing factors, a mixed use development and Major League Baseball stadium for the Atlanta Braves are planned on undeveloped property along Circle 75 Parkway to the northeast and the site is expected to generate additional demand on the currently congested intersections.

The US 41/SR 3/Cobb Parkway corridor is part of the Georgia Department of Transportation's (GDOT) Regional Traffic Operations Program (RTOP) and the signal operation at the intersection is dynamically managed as part of an intelligent transportation system known as the Sydney Coordinated Adaptive Traffic System (SCATS). This system employs vehicle and pedestrian detection through cameras and detector loops and adjusts signal timing in real-time to serve detected queues. The corridor is also a component of the state's Regional Thoroughfare Network (RTN).

The project is intended to improve the operations on the mixed-use site's entering and exiting approaches (northbound and westbound) at Cobb Parkway and Spring Road/Circle 75 Parkway and to add a free-flowing right turn lane to the westbound off-ramp of I-285 for traffic accessing the proposed mixed-use site from the freeway. Further operational improvements to the northbound left turn lanes on Cobb Parkway will be made to increase capacity of the left turn onto Spring Road westbound. Additionally, a new signalized intersection on Circle 75 Parkway at a proposed extension of Heritage Court will be constructed to improve circulation within the mixed-use development.

The proposed mixed-use development and stadium meets minimum criteria set forth in the Georgia Department of Community Affairs (DCA) *Development of Regional Impact* (DRI) legislation. As such, several traffic engineering studies have been conducted to determine initial impacts to road systems and to study potential improvements for locations that will be significantly affected by the additional traffic demand. The concept that is presented in this report has been derived over the course of three traffic engineering studies, including one that is being prepared concurrently with this concept report. The three traffic engineering studies that have been conducted with regards to this development are:

- Atlanta Braves Stadium and Mixed-Use Development, DRI #2381; May 2014 prepared by Kimley-Horn and Associates
- Summary of Findings: Spring Road at US 41; November 2014 prepared by Arcadis
- Traffic Engineering Reports for the Intersections of US 41/Cobb Parkway at Spring Road/Circle 75 Parkway and US 41/Cobb Parkway at the I-285-WB Ramp; April 2015 prepared by Pond & Company

The traffic engineering report that accompanies this concept report uses the intersection Level of Service scale (A-F) defined by the 2010 Highway Capacity Manual as the performance goal by which each intersection's improvements were measured.

Cobb Parkway Project Limits
The project limits extend on Cobb Parkway from the southeast side of the intersection with the I-285 West off-ramp to 430' northwest of the intersection with Spring Road/Circle 75 Parkway where lanes will taper back to the existing alignment.

I-285 West Off-Ramp Project Limits
The northwest edge of pavement on the I-285 off-ramp will be reconstructed for the free-flowing right turn lane.

Spring Road Project Limits
The modifications to the northbound left turn lanes on Cobb Parkway will tie into a separate, proposed project on Spring Road to widen to three westbound receiving lanes.

Circle 75 Parkway and Heritage Court Extension Project Limits
Limits of construction on Circle 75 Parkway will extend approximately 680' to the east to the proposed intersection with the Heritage Court extension and will require reconstruction of the northwest edge of pavement. The southeastern quadrant radius will be increased and will require moving the edge of pavement to fit in the free-flowing lane.

Existing conditions:
US 41/Cobb Parkway at I-285 West Off-Ramp/On-Ramp
At this intersection, Cobb Parkway consists of six through lanes (three lanes, bidirectional) while the I-285 off-ramp has five lanes on approach. In addition to the three northbound through lanes on Cobb Parkway, dual northbound left turn lanes serve traffic onto I-285 West. These two turn lanes are approximately 800' in length and extend back through the adjacent signal to the south (Cobb Parkway at I-285 East on-ramp). In addition to the three southbound through lanes on Cobb Parkway, a single, 500' southbound right turn lane onto the I-285 West on-ramp is created by a lane drop from the southbound direction. Two southbound left turn lanes onto the I-285 East on-ramp (at the adjacent signal to the south) extend back through this intersection as well. The I-285 on-ramp has two receiving lanes and is controlled by a ramp meter during times of peak hour congestion.

The I-285 West off-ramp consists of three right turn lanes onto Cobb Parkway north and two left turn lanes onto Cobb Parkway south. Right turns on red are permitted. Overhead signs indicate that the leftmost right turn lane leads to Spring Road and Smyrna while the other two right turn lanes lead to US 41 North. Both left turn lanes are signed for US 41 South.

The intersection is signalized with pedestrian crosswalks across both freeway ramps (I-285 West on and off). Pedestrian push-buttons and signals are present at the crossing of the I-285 West on-ramp and are not present at the crossing of the I-285 West off-ramp. Pedestrian crossings across Cobb Parkway are not permitted at this location.

US 41/Cobb Parkway at Spring Road/Circle 75 Parkway
Cobb Parkway widens from a six-lane to an eight-lane highway (four-lanes, bidirectional) between this intersection and the adjacent intersection with the I-285 West ramps to the south. At the intersection, the north- and southbound approaches widen even further to include several auxiliary turn lanes. Dual northbound and southbound left turn lanes exist on Cobb Parkway while a single 150' northbound right turn lane exists for turns onto Circle 75 Pkwy from the south. A fifth southbound through lane is added to the southbound approach and aligns with the southbound left turn lane onto I-285 East further downstream.

The westbound approach of Circle 75 Parkway is a four-lane road (two lanes, bidirectional) that widens at the intersection to a shared through-right turn lane with channelization for the right turn, a shared through-left turn lane, and a dedicated left turn lane. The eastbound approach of Spring Road has three lanes in the easterly direction and two receiving lanes in the westerly direction with a flush, two-way left turn lane median. At the intersection, the three eastbound lanes widen into two right turn lanes, and shared through-left turn lane, and a dedicated left turn lane. Sidewalks are present on all four corners. Pedestrian push-buttons and signals with countdown timers are present across the southbound, eastbound, and westbound legs of the intersection. Pedestrian crossing of Cobb Parkway on the northbound leg is not permitted due to a right-turn overlap phase that would conflict with pedestrian movements.

Other projects in the area:

- SunTrust Park and Mixed Use Development DRI along Circle 75 Parkway
- CO-451; Spring Road westbound widening (City of Smyrna)
- Cobb Parkway at I-285 East ramp termini intersection improvements
- Cobb Parkway at Windy Ridge Parkway intersection improvements
- Northwest Corridor Managed Lanes (from I-75/I-285 Interchange to I-75/Hickory Grove Road Interchange; GDOT PI #0008256)
- CO-459; Pedestrian Bridge over I-285 from Cobb Galleria Centre to proposed SunTrust Park site
- 0010510-US 41 – Windy Ridge to SR 120 Scoping
- AR-475; Connect Cobb

MPO: Atlanta Regional Commission (ARC) **TIP #:** CO-457

TIA Regional Commission: Atlanta Regional Commission
Congressional District(s): 11

Federal Oversight: ☐ PoDI ☐ Exempt ☐ State Funded ☒ Other (Local)

Projected Traffic: ADT 24 HR T: 5 %

Year	Cobb Parkway ADT (vpd)	Spring Road ADT (vpd)
Current Year (2015)	42,231	34,909
Open Year (2017)	43,080	35,610
Design Year (2019)	43,945	36,326

Traffic Projections Performed by: 1% per year growth rate taken from DRI #2381 Analysis Report; ADT projections performed by Pond & Company

Functional Classification (Cobb Parkway): Urban Principal Arterial

Complete Streets - Bicycle, Pedestrian, and/or Transit Standard Warrants:
Warrants met: ☐ None ☐ Bicycle ☒ Pedestrian ☒ Transit

Is this a 3R (Resurfacing, Restoration, & Rehabilitation) Project? ☒ No ☐ Yes

Pavement Evaluation and Recommendations*
Preliminary Pavement Evaluation Summary Report Required? ☒ No ☐ Yes
Preliminary Pavement Type Selection Report Required? ☒ No ☐ Yes
Feasible Pavement Alternatives: ☒ HMA ☐ PCC ☐ HMA & PCC

* This stretch of Cobb Parkway is programmed for resurfacing; Project M004877.

DESIGN AND STRUCTURAL

Description of the proposed project: The project concept that is defined in this report includes operational improvements at two existing intersections and design of a proposed third intersection. The two existing intersections are located on US 41/Cobb Parkway at the I-285 West off-ramp and at Spring Road/Circle 75 Parkway in Cobb County. The third, proposed intersection is on Circle 75 Parkway approximately 680' east of the intersection with Cobb Parkway where a proposed extension of Heritage Court would intersect. This proposed intersection would be signalized.

Cobb Parkway at I-285 West Ramp

- Westbound: Construct an additional right turn lane from I-285 off-ramp. This right turn lane will be free-flowing and will enter the eastbound traffic stream on Circle 75 Parkway east of the signal with Cobb Parkway. This design will allow for traffic entering the proposed site from I-285 West to bypass both signals on Cobb Parkway and will prevent overcapacity conditions on the freeway ramp and in the existing northbound right turn lane on Cobb Parkway onto Circle 75 Parkway.

Cobb Parkway at Spring Road/Circle 75 Parkway

- Northbound: The northbound approach will be modified to include a third left turn lane. This project will be constructed in conjunction with a widening project on Spring Road that will increase the number of receiving lanes to three. In addition to the increase in number of turn lanes, the overall storage length will be increased. A fourth through lane will be replaced through the widening of Cobb Parkway to the east and the existing northbound right turn lane will be lengthened to approximately 400'.
- Westbound: the westbound approach will be widened to accommodate significant exiting volume generated by the development. Triple left turns are proposed, along with one through lane and one shared through-right turn lane.
- Eastbound: the eastbound approach will be widened and reconfigured by a separate City of Smyrna project currently under design. This project is being coordinated with and will match the lane requirements necessary for the subject project.

Circle 75 Parkway at Heritage Court

- This proposed intersection will consist of two through lanes in each direction on Circle 75 Pkwy, and dedicated left turn lanes in both the east and westbound directions with a dedicated right westbound. The side street approaches will consist of a dedicated left turn lane and a shared through-right turn lane for the northbound approach and a dedicated left turn lane and right turn lane plus one through lane on the southbound approach.

Major Structures: N/A

Mainline Design Features:

US 41/SR 3/Cobb Parkway – Urban Principal Arterial

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**Varies 11-12 (with Aux. lanes)**	**4**	**14 (with Aux. lanes)**
- **Lane Width(s)**	**Varies 11 ½' - 12'**	**11'-12'**	**12'**
- **Median Width & Type**	**Varies 5' – 32'; raised**	**20' raised**	**Varies 5'-32'; raised**
- **Outside Shoulder or Border Area Width**	**Varies 10'-15'**	**10'-16'**	**4'**
- **Outside Shoulder Slope**	**-**	**2%**	**n/a**
- **Sidewalks**	**6 ½'**	**5'**	**n/a****
- **Auxiliary Lanes**	**12'**	**11'-12'**	**12'**
Posted Speed	**45 mph**		**45 mph**
Design Speed	**-**	**45 mph**	**45 mph**
Min Horizontal Curve Radius	**-**	**n/a**	**n/a**
Maximum Superelevation Rate	**-**	**4%**	**Match existing**
Maximum Grade	**-**	**-**	**Match existing**
Access Control	**By Permit**	**By Permit**	**By Permit**
Design Vehicle	**-**	**-**	**WB-40**
Pavement Type	**Asphalt**	**-**	**Asphalt**

*According to current GDOT design policy if applicable

** Due to continuous flow right turn lane from I-285 WB Exit Ramp to Circle 75 Eastbound, adding pedestrian facilities on the east side of Cobb Parkway is not feasible.

I-285 West Ramp – Freeway Ramp

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**5**		**6**
- **Lane Width(s)**	**12'**	**12'**	**12'**
- **Outside Shoulder or Border Area Width**	**Varies 5'-12'**	**14'**	**15 ½'**
- **Outside Shoulder Slope**	**4%**	**4%-6%**	**4%-6%**
Maximum Superelevation Rate	**-**	**6%**	**Match existing**
Maximum Grade	**-**	**-**	**Match existing**
Access Control	**Limited**	**Limited**	**Limited**
Design Vehicle	**-**	**-**	**WB-40**
Pavement Type	**Asphalt**	**-**	**Asphalt**

*According to current GDOT design policy if applicable

Circle 75 Parkway – Urban Local Road

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**4**		**8 (with Aux. lanes)**
- **Lane Width(s)**	**11 ½'**	**10'-12'**	**11'**
- **Median Width & Type**	**10'; raised**	**n/a**	**n/a**
- **Outside Shoulder or Border Area Width**		**10'-16'**	**18 ½'**
- **Outside Shoulder Slope**		**2%**	**2%**
- **Sidewalks**	**6 ½'**	**5'**	**12'**
- **Auxiliary Lanes**	**11 ½'**	**11'**	**11'**
Posted Speed	**30 mph**		**30 mph**
Design Speed	**30 mph**	**30 mph**	**30 mph**
Min Horizontal Curve Radius	**289'**	**250'**	**289'**
Maximum Superelevation Rate	**-**	**4%**	**Match existing**
Maximum Grade	**-**	**-**	**Match existing**
Access Control	**By Permit**	**By Permit**	**By Permit**
Design Vehicle	**-**	**-**	**WB-40**
Pavement Type	**Asphalt**	**-**	**Asphalt**

*According to current GDOT design policy if applicable

Major Interchanges/Intersections:

Interchanges: One interchange exists within the limits of this project. The interchange is between Cobb Parkway and I-285.

Major Intersections: 2 major intersections exist within the limits of this project and are the two intersections that have proposed modifications associated with them. Those intersections are:
- Cobb Parkway and I-285 West ramps
- Cobb Parkway and Spring Road/Circle 75 Parkway

Lighting required: ☐ No ☒ Yes

Off-site Detours Anticipated: ☒ No ☐ Yes ☐ Undetermined

Transportation Management Plan [TMP] Required: ☒ No ☐ Yes
If Yes: Project classified as: ☐ Non-Significant ☐ Significant
TMP Components Anticipated: ☐ TTC ☐ TO ☐ PI

Design Exceptions to FHWA/AASHTO controlling criteria anticipated:

FHWA/AASHTO Controlling Criteria	No	Undeter-mined	Yes	Appvl Date (if applicable)
1. Design Speed	☒	☐	☐	
2. Lane Width	☒	☐	☐	
3. Shoulder Width	☒	☐	☐	
4. Bridge Width	☒	☐	☐	
5. Horizontal Alignment	☒	☐	☐	
6. Superelevation	☒	☐	☐	
7. Vertical Alignment	☒	☐	☐	
8. Grade	☒	☐	☐	
9. Stopping Sight Distance	☒	☐	☐	
10. Cross Slope	☒	☐	☐	
11. Vertical Clearance	☒	☐	☐	
12. Lateral Offset to Obstruction	☒	☐	☐	
13. Bridge Structural Capacity	☒	☐	☐	

Design Variances to GDOT Standard Criteria anticipated:

GDOT Standard Criteria	Reviewing Office	No	Undeter--mined	Yes	Appvl Date (if applicable)
1. Access Control/Median Openings	DP&S	☒	☐	☐	
2. Intersection Sight Distance	DP&S	☒	☐	☐	
3. Intersection Skew Angle	DP&S	☒	☐	☐	
4. Lateral Offset to Obstruction	DP&S	☒	☐	☐	
5. Rumble Strips	DP&S	☒	☐	☐	
6. Safety Edge	DP&S	☒	☐	☐	
7. Median Usage	DP&S	☒	☐	☐	
8. Roundabout Illumination Levels	DP&S	☒	☐	☐	
9. Complete Streets	DP&S	☒	☐	☐	
10. ADA & PROWAG	DP&S	☒	☐	☐	
11. GDOT Construction Standards	DP&S	☒	☐	☐	
12. GDOT Drainage Manual	DP&S	☒	☐	☐	
13. GDOT Bridge & Structural Manual	Bridges	☒	☐	☐	

VE Study anticipated: ☒ No ☐ Yes ☐ Completed – Date:

UTILITY AND PROPERTY

Temporary State Route needed: ☒ No ☐ Yes ☐ Undetermined

Railroad Involvement: There is no anticipated railroad involvement.

Utility Involvements:

- Atlanta Gas Light
- AT&T Distribution
- AT&T Transmission
- Cobb County Water System
- Cobb County Marietta Water Authority
- Cobb DOT Traffic Fiber
- Colonial Pipeline Company
- Cobb EMC
- Georgia Power Company – Distribution
- Georgia Power Company – Transmission
- Georgia Transmission Corporation
- Comcast Cable of Georgia
- Charter
- Fiberlight
- Level 3
- Verizon Business/MCI
- Tower Cloud
- TW Telecom
- X/O Communications
- Zayo

SUE Required: ☐ No ☒ Yes ☐ Undetermined

Public Interest Determination Policy and Procedure recommended? ☒ No ☐ Yes

Right-of-Way (ROW):
Cobb Pkwy. Existing width: 180-280 (varies) ft. Proposed width: 180-280 (varies) ft.

I-285 West Ramp. Existing width: 70-180 (varies; measured from south side EOP) ft.
Proposed width: 70-180 (varies; measured from south side EOP) ft.

Circle 75 Pkwy. Existing width: 60-80 (varies) ft. Proposed width: 120 ft.

Required Right-of-Way anticipated: ☐ None ☒ Yes ☐ Undetermined
Easements anticipated: ☐ None ☒ Temporary ☒ Permanent ☐ Utility ☐ Other

Anticipated total number of impacted parcels: 5
Displacements anticipated: Businesses: 0
Residences: 0
Other: 0
Total Displacements: 0

Location and Design approval: ☒ Not Required ☐ Required

CONTEXT SENSITIVE SOLUTIONS

Issues of Concern: There are no identified context-sensitive issues.

Context Sensitive Solutions Proposed: N/A

ENVIRONMENTAL & PERMITS

Anticipated Environmental Document:

GEPA: ☐ **NEPA:** ☒ CE ☐ EA/FONSI ☐ EIS

MS4 Permit Compliance – Is the project located in a MS4 area? ☐ No ☒ Yes

Environmental Permits/Variances/Commitments/Coordination anticipated:

Permit/ Variance/ Commitment/ Coordination Anticipated	No	Yes	Remarks
1. U.S. Coast Guard Permit	☒	☐	
2. Forest Service/Corps Land	☒	☐	
3. CWA Section 404 Permit	☒	☐	
4. Tennessee Valley Authority Permit	☒	☐	
5. Buffer Variance	☒	☐	
6. Coastal Zone Management Coordination	☒	☐	
7. NPDES	☐	☒	Land disturbance > 1 acre
8. FEMA	☒	☐	
9. Cemetery Permit	☒	☐	
10. Other Permits	☒	☐	
11. Other Commitments	☒	☐	
12. Other Coordination	☒	☐	

Is a PAR required? ☒ No ☐ Yes ☐ Completed – Date:

Environmental Comments and Information:

NEPA/GEPA: Based upon project type, a Programmatic Categorical Exclusion (PCE) is expected. No significant NEPA concerns.

Ecology: No jurisdictional waters or T&E habitat expected.

History: No eligible historic properties expected.

Archeology: No archaeological resources expected.

Air Quality:

Is the project located in a PM 2.5 Non-attainment area? ☐ No ☒ Yes

Is the project located in an Ozone Non-attainment area? ☐ No ☒ Yes

Carbon Monoxide hotspot analysis: ☒ Required ☐ Not Required ☐ TBD

CO hotspot modeling is expected due to lane changes at I-285 WB ramp and Cobb Pkwy signalized intersection.

Noise Effects: Noise expected to be cleared with Type III Noise Screening. Project will not halve distance between roadway and any sensitive noise receptor.

Public Involvement: None

Major stakeholders:
- Cobb County
- Georgia Department of Transportation
- City of Smyrna
- Local Businesses
- The Atlanta Braves
- Cumberland CID
- General Public

CONSTRUCTION

Issues potentially affecting constructability/construction schedule: N/A

Early Completion Incentives recommended for consideration: ☐ No ☒ Yes

COORDINATION, ACTIVITIES, RESPONSIBILITIES, AND COSTS

Initial Concept Meeting: To Be Determined

Concept Meeting: To Be Determined

Other coordination to date:
Coordination Meetings between Pond & Company and Cobb Department of Transportation occurred on the following dates:

3/2/2015: Kickoff Meeting: Topics included stadium parking locations, proposed additional connections between development and Cobb Pkwy, anticipated modifications to Preliminary Concept Drawing (by others), the need to prepare a GDOT Concept Report and Traffic Engineering Report for encroachment permit application, and project schedule.

3/23: Update Meeting: This meeting served to update CCDOT on the project status, and answered questions raised by Pond and CCDOT.

3/31: Update Meeting: This meeting was convened to share the current concept layout with CCDOT for comments, specifically related to modifications from preliminary concept layout.

Project Activity	Party Responsible for Performing Task(s)
Concept Development	Cobb DOT, Pond & Company
Design	Pond & Company
Right-of-Way Acquisition	Cobb DOT
Utility Relocation	Utility Companies, Cobb DOT
Letting to Contract	Cobb DOT
Construction Supervision	Cobb DOT
Providing Material Pits	Hired Contractor
Providing Detours	Hired Contractor
Environmental Studies, Documents, & Permits	Pond & Company
Environmental Mitigation	N/A
Construction Inspection & Materials Testing	Cobb DOT, Hired Contractor

Project Cost Estimate Summary and Funding Responsibilities:

	Breakdown of PE	ROW	Reimbursable Utility	CST*	Environmental Mitigation	Total Cost
Funded By	Cobb Co. DOT	Cobb Co. DOT	Cobb Co. DOT	Cobb Co. DOT	Cobb Co. DOT	
$ Amount	297,950	150,000	250,000	3,490,354	0	4,188,304
Date of Estimate	4/3/15	4/3/15	4/3/15	4/3/15	4/3/15	

*CST Cost includes: Construction, Engineering and Inspection, Contingencies and Liquid AC Cost Adjustment.

ALTERNATIVES DISCUSSION

Alternative selection:

Preferred Alternative: *Additional I-285 West ramp free-flow lane to Circle 75 Pkwy.; Additional NB left turn lane on Cobb Pkwy. at Spring Rd.; three LT lanes from Circle 75 Pkwy. WB onto Cobb Pkwy.*			
Estimated Property Impacts:	**5**	**Estimated Total Cost:**	**$4,188,304**
Estimated ROW Cost:	**$150,000.00**	**Estimated CST Time:**	**1 Year**
Rationale: *This alternative is preferred because of the level of service benefits that are provided by the additional turn lanes and the free-flow freeway ramp exit lane. PM and Weekend peak hour LOS is reduced from "F" to "E" at the intersection of Cobb Pkwy and Circle 75 Pkwy. while the peak hour LOS at the intersection of the I-285 West ramp and Cobb Pkwy is reduced from "F" to "D". This solution also eliminates the need for traffic from I-285 East and the Cumberland area to the south to merge with a free-flowing movement coming off I-285 West to turn right at Circle 75 Pkwy.*			

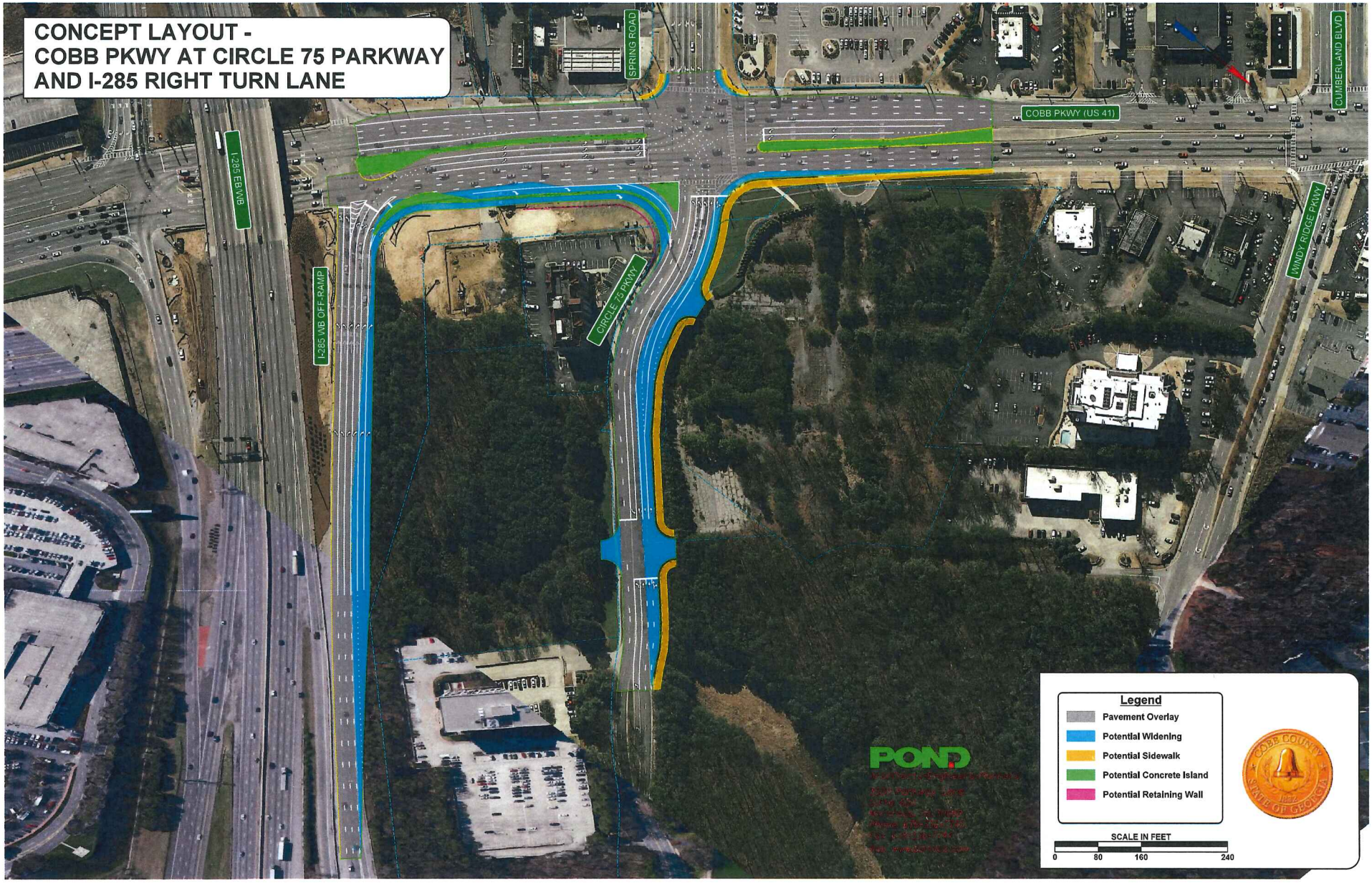
No-Build Alternative: *Maintain existing lane geometry at both intersections*			
Estimated Property Impacts:	**-**	**Estimated Total Cost:**	**$0**
Estimated ROW Cost:	**$0**	**Estimated CST Time:**	**-**
Rationale: *Maintaining the existing geometry will result in significant level of service failure, congestion, and lost signal time at these two critical intersections near I-285. If delays become too excessive in this area, congestion will form leaving SunTrust Park, north- and southbound on Cobb Parkway, and is likely to impact traffic flows on I-285 due to the backups caused by baseball game traffic.*			

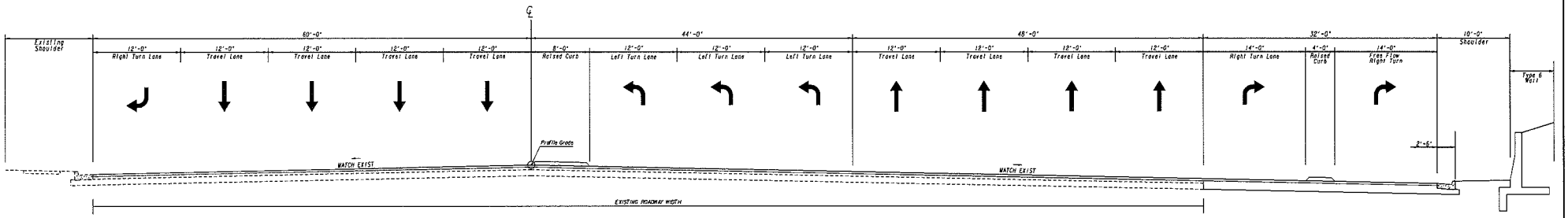
Other Alternative(s): *Add fourth I-285 West off-ramp right turn lane received by NB right turn lane on Cobb Pkwy. at Cir. 75 Pkwy.*			
Estimated Property Impacts:	-	**Estimated Total Cost:**	**$3,800,000**
Estimated ROW Cost:	**$125,000**	**Estimated CST Time:**	-
Rationale: *This concept was developed as a potential improvement in the DRI #2381 documentation. This design is very similar to the preferred alternative, with the main exception being that the newly constructed WB right turn lane at the I-285 off-ramp is not "free-flowing" because it shares the right turn lane into the park with traffic coming from the south and from further west on I-285. This geometry would create a weave section between high volumes (where I-285 WB freeway traffic would be required to weave with US 41 NB and I-285 EB traffic). This point was deemed to be a potential bottleneck for entering traffic, and therefore the preferred alternative was developed that gives entering freeway traffic a dedicated lane to use that bypasses both signals on Cobb Parkway.*			

Comments: None

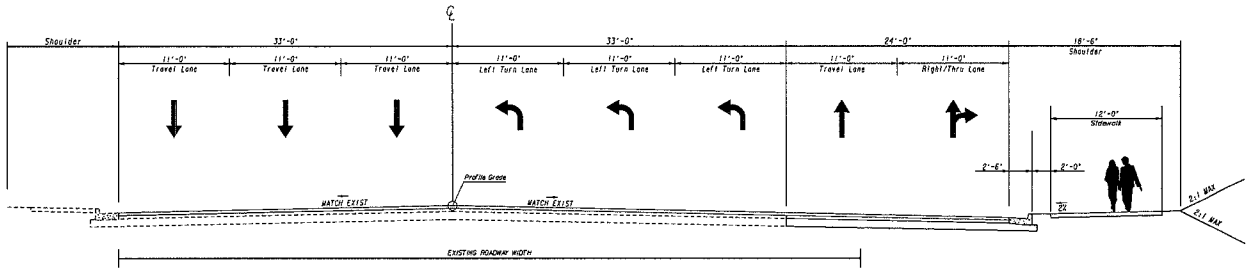
LIST OF ATTACHMENTS/SUPPORTING DATA

1. Concept Layout
2. Typical sections
3. Detailed Cost Estimates:
    a. Construction including Engineering and Inspection and Contingencies
4. US 41/Cobb Parkway at I-285 West Ramps TE Report
    a. 2019 Build Traffic Volumes
5. US 41/Cobb Parkway at Spring Road/Circle 75 Parkway TE Report
    a. 2019 Build Traffic Volumes
6. Minutes of Concept meetings
7. Project Schedule

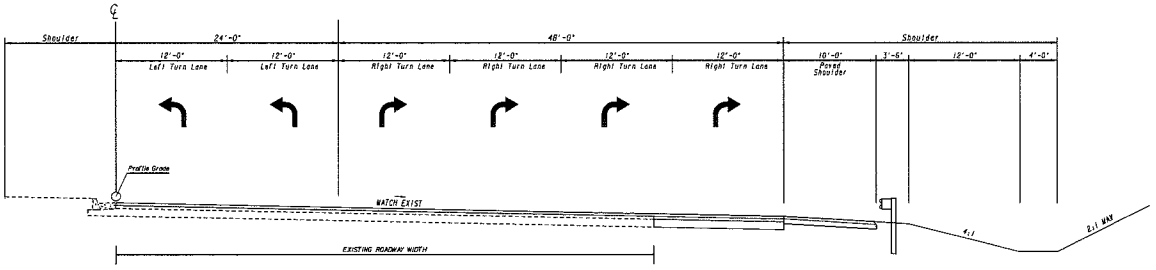

CONCEPT LAYOUT -
COBB PKWY AT CIRCLE 75 PARKWAY
AND I-285 RIGHT TURN LANE
SPRING ROAD
COBB PKWY (US 41)
CUMBERLAND BLVD
I-285 EB/WB
I-285 WB OFF-RAMP
CIRCLE 75 PKWY
WINDY RIDGE PKWY
POND
Legend
Pavement Overlay
Potential Widening
Potential Sidewalk
Potential Concrete Island
Potential Retaining Wall
SCALE IN FEET
0
80
160
240



Cobb Parkway / US 41



Circle 75 Parkway



I-285 West Off-Ramp

CONCEPT TYPICAL SECTIONS- Cobb Parkway at Circle 75 Parkway and I-285 Right Turn Lane

POND
Architects-Engineers-Planners
3500 Parkway Lane
Suite 600 •
Norcross, Ga. 30092
Phone 678-336-7740
Fax 678-336-7744
Web www.pondco.com

Client	Cobb County
Client Project No:	X2403
Description	Intersection Improvements at US 41/Cobb Pkwy at Spring Rd/Circle 75 Pkwy at the I-285 West Off-Ramp
Date:	4/3/2015

CONSTRUCTION COST ESTIMATE

ITEM NO.	DESCRIPTION	UNIT	QTY	PRICE	COST
	ROADWAY ITEMS				
150-1000	Traffic Control	LS	1	$ 150,000.00	$ 150,000.00
205-0100	Construction Allowance	LS	1	$ 100,000.00	$ 100,000.00
210-0100	Grading Complete	LS	1	$ 100,000.00	$ 100,000.00
432-5010	Mill Asph Conc Pvmt, Variable Depth	SY	28088	$ 5.27	$ 148,023.76
402-3910	Recycled Asph Conc 12.5 MM Superpave, GP 1 or 2, Incl Bitum Matl & H Lime	SY	37914	$ 8.63	$ 327,197.82
402-4012	Recycled Asph Conc 19 MM Superpave, GP 1 or 2, Incl Bitum Matl & H Lime	SY	9826	$ 10.46	$ 102,779.96
402-4310	Recycled Asph Conc 25 MM Superpave, GP 1 or 2, Incl Bitum Matl & H Lime	SY	9826	$ 18.04	$ 177,261.04
310-5120	Gr Aggr Base Crs, 12 Inch, Incl Matl	SY	9826	$ 22.65	$ 222,558.90
413-1000	Bitum Tack Coat	GL	2240	$ 3.61	$ 8,086.40
402-1812	Recycled Asph Conc Leveling, Incl Bitum Matl & H Lime	TN	300	$ 87.06	$ 26,118.00
500-9999	Class B Conc, Base or Pvmt Widening	CY	12	$ 208.83	$ 2,505.96
441-6216	Conc Curb & Gutter, 8 IN x 24 IN, TP 2	LF	1000	$ 15.30	$ 15,300.00
441-6222	Conc Curb & Gutter, 8 IN x 30 IN, TP 2	LF	1369	$ 19.64	$ 26,887.16
441-0748	Concrete Median, 6 IN	SY	680	$ 54.32	$ 36,937.60
441-0106	Conc Sidewalk, 6 IN	SY	1212	$ 48.60	$ 58,903.20
441-0108	Conc Sidewalk, 8 IN	SY	156	$ 65.69	$ 10,247.64
621-6211	Concrete Side Barrier, Type 6-SA	LF	251	$ 377.26	$ 94,692.26
627-1000	MSE Wall Face, 0-10 FT HT, Wall No. 1	SF	1500	$ 45.06	$ 67,590.00
627-1010	MSE Wall Face, 10-20 FT HT, Wall No. 1	SF	2500	$ 46.13	$ 115,325.00
441-4020	Conc Valley Gutter, 6 IN	SY	204	$ 39.17	$ 7,990.68
446-1100	Pvmt Reinf Fabric Strips, TP 2, 18 Inch Width	LF	4120	$ 4.98	$ 20,517.60
620-0100	Temporary Barrier, Method No. 1	LF	500	$ 26.86	$ 13,430.00
634-1200	Right of Way Markers	EA	50	$ 121.17	$ 6,058.50
641-1200	Guardrail, TP W	LF	1100	$ 18.31	$ 20,141.00
641-5001	Guardrail Anchorage, TP 1	EA	1	$ 867.70	$ 867.70
641-5012	Guardrail Anchorage, TP 12	EA	1	$ 2,179.66	$ 2,179.66
	DRAINAGE				
550-1180	Storm Drain Pipe, 18 IN, H 1-10	LF	2500	$ 46.87	$ 117,175.00
550-4218	Flared End Section 18 IN, Storm Drain	EA	5	$ 592.61	$ 2,963.05
603-2181	STN Dumped Rip Rap, TP 3, 18 IN	SY	120	$ 50.60	$ 6,072.00
603-7000	Plastic Filter Fabric	SY	120	$ 4.05	$ 486.00
611-8000	Adjust Catch Basin to Grade	EA	3	$ 1,266.67	$ 3,800.01
668-1100	Catch Basin, GP 1	EA	10	$ 2,376.85	$ 23,768.50
668-1110	Catch Basin, GP 1, Addl Depth	LF	10	$ 212.92	$ 2,129.20
	EROSION CONTROL - PERMANENT				
700-6910	Permanent Grassing	AC	2	$ 1,230.76	$ 2,461.52
700-7000	Agricultural Lime	TN	6	$ 101.57	$ 609.42
700-8000	Fertilizer Mixed Grade	TN	12	$ 623.65	$ 7,483.80
700-8100	Fertilizer Nitrogen Content	LB	250	$ 4.18	$ 1,045.00
700-9300	SOD	SY	500	$ 5.88	$ 2,940.00
716-2000	Erosion Control Mats, Slopes	SY	1500	$ 1.32	$ 1,980.00
	EROSION CONTROL - TEMPORARY				
163-0232	Temporary Grassing	AC	4	$ 573.07	$ 2,292.28
163-0240	Mulch	TN	50	$ 250.31	$ 12,515.50
163-0300	Construction Exit	EA	6	$ 1,324.73	$ 7,948.38
163-0550	Construct and Remove Inlet Sediment Trap	EA	13	$ 167.19	$ 2,173.47
165-0030	Maintenance of Temporary Silt Fence, TP C	LF	2500	$ 0.76	$ 1,900.00
165-0101	Maintenance of Construction Exit	EA	6	$ 549.88	$ 3,299.28
165-0105	Maintenance of Inlet Sediment Trap	EA	7	$ 62.52	$ 437.64
167-1000	Water Quality Monitoring and Sampling	EA	10	$ 15,100.00	$ 151,000.00
167-1500	Water Quality Inspections	MO	12	$ 298.69	$ 3,584.28
171-0030	Temporary Silt Fence, Type C	LF	5000	$ 2.98	$ 14,900.00
643-8200	Barrier Fence (Orange), 4 FT	LF	200	$ 1.60	$ 320.00
	SIGNING AND MARKING				
610-9001	Remove Sign	EA	20	$ 100.92	$ 2,018.40
611-5551	Reset Sign	EA	20	$ 136.48	$ 2,729.60
636-1020	Highway Signs, TP 1 Matl, Refl Sheeting, TP 3	SF	250	$ 15.39	$ 3,847.50

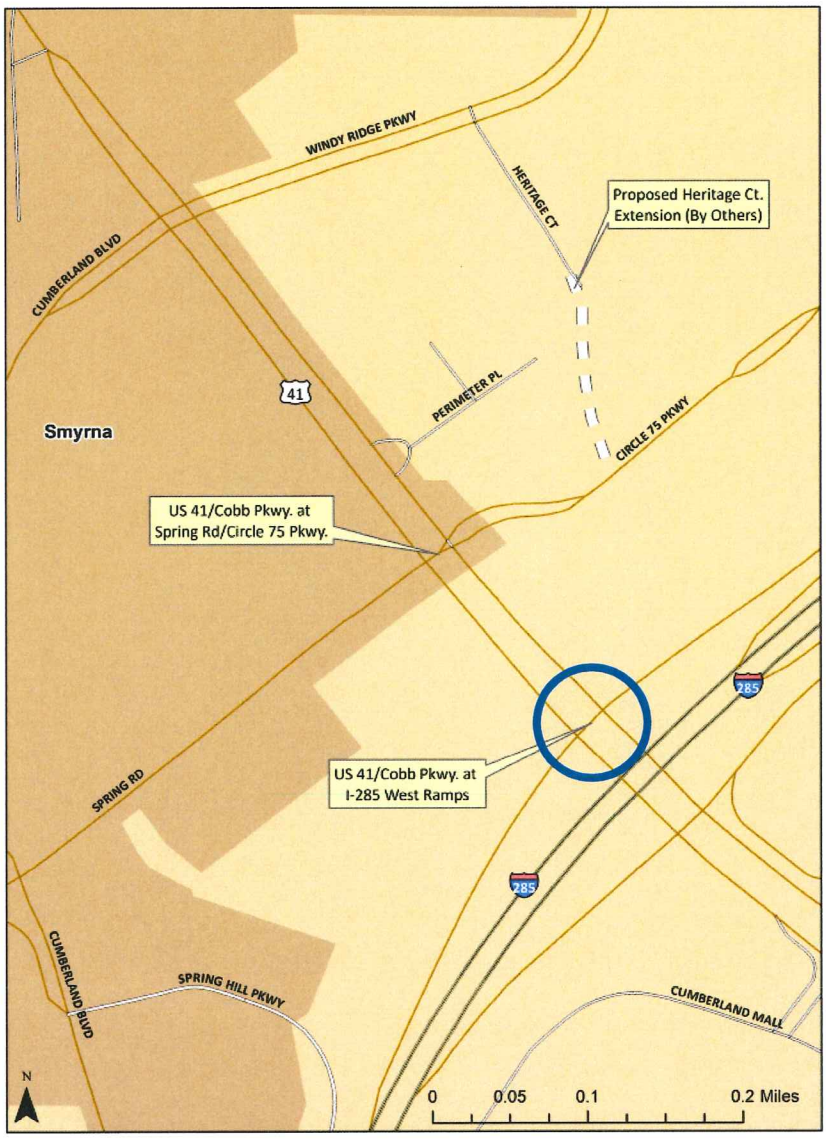
636-1045	Highway Signs, TP 1 Matl, Refl Sheeting, TP 11	SF	500	$ 23.55	$ 11,775.00
636-2070	Galv Steel Posts, TP 7	LF	1000	$ 8.26	$ 8,260.00
638-1001	Str Support for Overhead Sign, TP 1	LS	4	$ 75,000.00	$ 300,000.00
636-1072	Highway Signs, Alum Extruded Panels, Refl Sheeting, TP 3	SF	750	$ 25.20	$ 18,900.00
653-0120	Thermoplastic Pvmt Marking, Arrow, TP 2	EA	60	$ 87.46	$ 5,247.60
653-0130	Thermoplastic Pvmt Marking, Arrow, TP 3	EA	2	$ 113.09	$ 226.19
653-0230	Thermoplastic Pvmt Marking, Word, TP 3A	EA	5	$ 214.86	$ 1,074.30
653-1501	Thermoplastic Solid Traf Stripe, 5 IN, White	LF	11240	$ 0.63	$ 7,081.20
653-1502	Thermoplastic Solid Traf Stripe, 5 IN, Yellow	LF	2537	$ 0.62	$ 1,572.94
653-1704	Thermoplastic Solid Traf Stripe, 24 IN, White	LF	259	$ 6.75	$ 1,748.25
653-1804	Thermoplastic Solid Traf Stripe, 8 IN, White	LF	816	$ 2.45	$ 1,999.20
653-3501	Thermoplastic Skip Traffic Stripe, 5 IN, White	GLF	7772	$ 0.48	$ 3,730.56
653-6004	Thermoplastic Traf Stripping, White	SY	257	$ 4.32	$ 1,110.24
653-6006	Thermoplastic Traf Stripping, Yellow	SY	100	$ 4.27	$ 427.00
654-1001	Raised Pvmt Markers TP 1	EA	300	$ 4.97	$ 1,491.00
654-1003	Raised Pvmt Markers TP 3	EA	100	$ 5.05	$ 505.00
	SIGNAL				
647-1000	Traffic Signal Installation - No. 1	LS	1	$ 150,000.00	$ 150,000.00
647-1000	Traffic Signal Installation - No. 2	LS	1	$ 150,000.00	$ 150,000.00
647-1000	Traffic Signal Installation - No. 3 (Paid for by others)	LS	1	$ -	$ -
	SUBTOTAL				$ 2,908,628.15
	CONTINGENCY - 15%				$ 436,294.22
	INFLATION - 5%				$ 145,431.41
	TOTAL				$ 3,490,353.78

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
TRAFFIC ENGINEERING REPORT

For the intersections of:

US 41/Cobb Parkway at the I-285 WB Ramps

Cobb County At Mile log: 1.67



Report prepared by:

Richard Fangmann, P.E., Pond & Company

3500 Parkway Lane, Suite 600, Norcross, GA 30092

P: 678.336.7740

FangmannR@pondco.com

Date report prepared: April, 2015

Location:

The intersections that are investigated in this traffic study are located on US 41/Cobb Parkway in Cobb County. The study area is located northwest of the Cumberland area and it encompasses the I-285 West Off-Ramp/On-Ramp as well as one entrance to the proposed SunTrust Park Development of Regional Impact (DRI) that is proposed for the undeveloped tract between Circle 75 Parkway and Windy Ridge Parkway. In addition to the two intersections being modified, a third intersection, Cobb Parkway at I-285 East On-Ramp/Off-Ramp, was included in the study due to its proximity to the site and to the fact that trips originating on I-285 must pass through both intersections to exit the freeway on arrival and then re-enter the freeway upon the return trip. This study provides traffic engineering information and recommendations related to the intersection of US 41/Cobb Parkway and the I-285 West ramp. A separate TE Report has been prepared to document recommendations related to the intersection of US 41/Cobb Parkway and Spring Road/Circle 75 Parkway.

Reason for the investigation:

The purpose of this study is to evaluate the benefits of proposed geometric improvements to the intersections of Cobb Parkway and the I-285 West ramps under build traffic volumes generated by the aforementioned SunTrust Park and accompanying mixed-use development. Traffic analysis for the intersection was performed with the intent of identifying operational benefits to LOS and to determine queue storage lengths for turn lanes. Additionally, recommendations related to lane striping and signing are made in this report.

Description of the intersection:

US 41/Cobb Parkway at I-285 West Off-Ramp/On-Ramp

At this intersection, Cobb Parkway consists of six through lanes (three lanes, bidirectional) while the I-285 off-ramp has five lanes on approach. In addition to the three northbound through lanes on Cobb Parkway, dual northbound left turn lanes serve traffic onto I-285 West. These two turn lanes are approximately 800' in length and extend back through the adjacent signal to the south (Cobb Parkway at I-285 East on-ramp). In addition to the three southbound through lanes on Cobb Parkway, a single, 500' southbound right turn lane onto the I-285 West on-ramp is created by a lane drop from the southbound direction. Two southbound left turn lanes onto the I-285 East on-ramp (at the adjacent signal to the south) extend back through this intersection as well. The I-285 on-ramp has two receiving lanes and is controlled by a ramp meter during times of peak hour congestion.

The I-285 West off-ramp consists of three right turn lanes onto Cobb Parkway north and two left turn lanes onto Cobb Parkway south. Right turns on red are permitted. Overhead signs indicate that the leftmost right turn lane leads to Spring Road and Smyrna while the other two right turn lanes lead to US 41 North. Both left turn lanes are signed for US 41 South.

The intersection is signalized with pedestrian crosswalks across both freeway ramps (I-285 West on and off). Pedestrian push-buttons and signals are present at the crossing of the I-285 West on-ramp and are

not present at the crossing of the I-285 West off-ramp. Pedestrian crossings across Cobb Parkway are not permitted at this location.

Traffic volumes in vehicles per day (vpd):

Daily traffic volumes for Cobb Parkway and Spring Road as found in ***Table 1*** are Georgia Department of Transportation (GDOT) traffic counts.

Table 1: Average Daily Traffic by Year from GDOT Traffic Counters

Year	Station 0672143: Cobb Parkway	Station 0672806: Spring Road
2014	42,231	34,909
2013	42,200	33,130
2012	42,070	32,970
2011	41,360	33,150
2010	40,970	33,640
2009	45,191	35,420

Peak Hour Truck Percentage: 2% (source: DRI #2381)
Daily Truck Percentage: 5% (source: 2013 GDOT Traffic Counter #2143; Cobb Parkway)

Peak hour turning movement counts for each intersection, along with the intersection of Cobb Parkway at I-285 East, were taken directly from the Development of Regional Impact (DRI) document, *Atlanta Braves Stadium and Mixed-Use Development, DRI #2381*. Additionally, the background traffic growth rate of 1% was taken from the DRI document. Use of volumes and growth assumptions from the DRI document was done to maintain consistency with the approved traffic for this site.

Peak hour turning movement counts, by intersection, can be found in **Appendix A** of this traffic engineering report.

Existing Traffic Control:

Note: Cobb Parkway at Spring Road/Circle 75 Parkway is part of a larger intelligent transportation system known as a Sydney Coordinated Adaptive Traffic System (SCATS). The SCATS is implemented on Cobb Parkway to monitor traffic presence, platoon arrival rates, pedestrian activity, and other variables for the purposes of adapting traffic signal timing in real-time to meet changing peak hour demands.

<u>US 41/Cobb Parkway at I-285 West Off-Ramp/On-Ramp</u>

The intersection is currently signalized. The northbound left turns onto I-285 West are protected-only due to the dual lane configuration. The existing off-ramp traffic control permits right turns on red from all three lanes. Pedestrian push buttons and countdown timers are present on the west side of Cobb Parkway to control pedestrian across the I-285 West on-ramp. The crosswalk across the I-285 West off-ramp is unsignalized for pedestrians. An existing sign near the intersection implies that pedestrians are not allowed on the east side of Cobb Parkway within the vicinity of the I-285 interchange although site

visits indicate that pedestrians are using this crosswalk and walking along areas that are not intended for pedestrian traffic.

Vehicular Speeds:
The posted speed limit on Cobb Parkway is 45 mph. The freeway ramp does not have a posted speed limit.

Pedestrian Movements:
A continuous sidewalk with crosswalks exists on the western side of Cobb Parkway from north of Spring Road/Circle 75 Pkwy. to south of the I-285 interchange. Sidewalk continues on both sides of Spring Road and Circle 75 Pkwy. and is connected to a larger system of sidewalk outside of the study area. The sidewalk on the eastern side of Cobb Parkway is discontinuous between Galleria Drive (southeast of the I-285 East ramp intersection) and the I-285 West ramp intersection. An existing "No Pedestrian" sign is in place on the east side of Cobb Parkway north of the I-285 West ramp, which suggests that pedestrian traffic on this side of Cobb Parkway near the I-285 interchange is not desired. A crosswalk is in place across the I-285 West ramp, however, and no pedestrian push buttons or signals are in place. This crosswalk and "No Pedestrians" sign send a conflicting message to pedestrians as to whether or not it is appropriate to walk in this area. A site visit revealed that pedestrians are walking in this area even where sidewalks are discontinuous and are crossing the high-volume freeway exit ramp without the aid of pedestrian signals.

Future additions to the pedestrian network in the area will include a 12' multi-use trail on the north side of Spring Road and around the entire perimeter of the SunTrust Park and mixed-use development. A proposed pedestrian bridge that spans I-285 is planned to connect the site to a Cobb Galleria Centre parking deck southeast of I-285.

The addition of the free-flow lane from I-285 West to Circle 75 Pkwy. will necessitate restricting pedestrian movements on the east side of Cobb Parkway. The crossing of a high-volume free-flowing lane of traffic by pedestrians is not recommended at this location due to the high anticipated flow and direct connection from the freeway off-ramp to the stadium. This direct connection from I-285 West to Circle 75 Parkway will serve traffic directly from the freeway which will have a low driver expectancy for a stop due to pedestrians. Therefore pedestrians should be discouraged from entering this quadrant through design elements such as physical barriers and signage prohibiting pedestrian use along the east side of Cobb Parkway between the I-285 East and West ramps and between the I-285 West off-ramp and Circle 75 Parkway.

Other Modes of Transportation Present:
Cobb County Transit (CCT) routes 10 part-time route 10A converge at the intersection of Cobb Parkway and Spring Road/Circle 75 Parkway. A CCT bus shelter is in place on the north side of Spring Road. The bus stop is not located within the limits of construction for this intersection.

Parking:

On-street parking is not permitted in the vicinity of the study intersection.

Crash History:

The crash rates for each intersection were provided by Cobb County Department of Transportation and span a four-year period from 2011-2014. ***Table 2*** below summarizes the number of crashes, crash type, and number of injuries and fatalities.

Table 2: Crash Summary for Cobb Parkway at I-285 West Ramp; 2011-2014

	Number of Crashes Involving:				Number of	Number of	Type of Crash						
Year	PDO	Injuries	Fatalities	Total	Injuries	Fatalities	Right Angle	Head On	Rear End	Sideswipe	Left Turn	Fixed Object	Other
2011	27	10	0	**37**	12	0	2	0	23	3	2	6	1
2012	53	14	0	**67**	19	0	6	0	33	21	2	5	0
2013	34	11	0	**45**	21	0	4	1	25	13	2	0	0
2014	22	3	1	**26**	3	1	5	0	16	0	4	0	1
Total	**136**	**38**	**1**	**175**	**55**	**1**	**17**	**1**	**97**	**37**	**10**	**11**	**2**

The most prominent crash type that occurred at this intersection in the previous four years is rear ending (55%). This is common for signalized intersections with high volumes of traffic. Sideswipe crashes were the second-most frequent crash type, making up 21% of the total crashes occurring. This is likely a result of the wide cross section and numerous lane changes that are made to avoid lane drops.

22% of all crashes in the most recent four-year period resulted in at least one injury. One fatality occurred at this intersection in the reporting period and it involved a crash with a pedestrian.

Adjacent Signalized Intersections:

There are existing traffic signals at adjacent intersections, as indicated below.

- The next adjacent signal to the north is located 660' from the site at the intersection of Cobb Parkway and Spring Road/Circle 75 Parkway.
- The next adjacent signal to the south is located 400' from the site at the intersection of Cobb Parkway and the I-285 East ramps.

Warrant Analysis:

A warrant analysis was not performed for this intersection. The existing traffic control is a signal.

Intersection Level of Service and Delay:

The intersection was modeled for level of service (LOS) and delay values using Synchro 8, by Trafficware. Limitations due to custom signal phasing and conflicts between U-turns and protected right turn overlap phases are present in the 2010 Highway Capacity Manual (HCM) methodology for determining LOS. As a result, the 2000 HCM methodology was used for LOS and delay. Using this method also maintains consistency with the two studies already conducted for the site.

Existing LOS at this intersection is provided in the *DRI #2381*. That study found the 2014 existing AM, PM and Weekend LOS to be "C". This report investigates operations for both a 2019 no-build geometry and a 2019 build geometry scenario under PM peak hour and weekend peak hour conditions. Turning

movement volumes remain constant between the no-build and build scenarios to identify the direct benefits to LOS and delay that are created by the proposed geometric improvements. Peak hour turning movement counts and Synchro LOS reports are found in **Appendix B**. Existing and build scenario lane configurations can be found in the **Appendix C**. Note that signal timings were obtained from Cobb County DOT for entry into Synchro models. Corridor offsets and phase splits were optimized in the build scenarios to redistribute effective green time based on the new geometry. **Table 3** documents the PM LOS and delay for the intersection and each approach by scenario. The LOS and delay during the weekend peak hour are found in **Table 4**. Note that the Build Scenario delay calculations consider the effect of zero delay conditions experienced by traffic in the free-flow lane, and as a result, the intersection and approach LOS are better than those which are reported in Synchro 8.

Table 3: 2019 PM Peak Hour LOS and Delay, No Build and Build Scenarios

PM Peak	No Build		Build	
	LOS	Delay	LOS	Delay
Cobb Pkwy. at I-285 WB Ramps				
Intersection	F	214.3	D	35.4
Northbound Approach	B	16.8	B	14.9
Southbound Approach	E	66	D	45.3
Eastbound Approach	-	-	-	-
Westbound Approach	F	601.1	D	48.1

Table 4: 2019 Weekend Peak Hour LOS and Delay, No Build and Build Scenarios

Weekend Peak	No Build		Build	
	LOS	Delay	LOS	Delay
Cobb Pkwy. at I-285 WB Ramps				
Intersection	F	159.5	C	32.8
Northbound Approach	D	43.7	C	20.4
Southbound Approach	B	18.9	D	37.4
Eastbound Approach	-	-	-	-
Westbound Approach	F	454.1	D	39.3

The LOS tables above indicate that the demand generated by the proposed development will result in failing LOS for the intersection during PM and weekend peak hour times. The proposed improvements are effective at increasing the westbound off-ramp's capacity which results in an overall improvement in LOS to a "C" during weekend peaks and a "D" during PM peaks.

Westbound Lane Configuration (I-285 West Ramp)

As indicated in the TE Report for US 41/Cobb Parkway at Spring Road/Circle 75 Parkway the northbound left turn lanes that turn onto Spring Road should be lengthened back to the intersection with the I-285 West ramp and a third northbound left turn lane should be added to improve the capacity of the turning

movement onto Spring Road. These northbound left turn lanes on Cobb Parkway will serve as receiving lanes for the westbound right turn lanes on the off-ramp as described below.

Traffic coming off of I-285 West is currently directed into appropriate lanes in advance of the intersection through overhead signage. This signage should largely stay the same. The proposed concept for this ramp includes four right turn lanes. The left-most right turn lane should use pavement markings to direct traffic into the middle northbound left turn lane (and eventually onto Spring Road westbound). The second, adjacent right turn lane should allow traffic to turn into the right-most left turn lane onto Spring Road or continue northbound on Cobb Parkway. The third, adjacent right turn lane will access Cobb Parkway northbound while the new, fourth right turn lane will be free-flowing and continuous until Circle 75 Parkway eastbound. Overhead signage should be used to indicate the appropriate lane assignments on approach to the intersection. See the **Appendix C** for build approach lane configurations.

Westbound Free-Flow Lane Capacity Check

A capacity check of a single free-flowing turn lane during the PM peak hour was used to determine the effectiveness of the proposed improvement. If the demand on this lane exceeds the capacity of it, then its effectiveness is significantly reduced. The approximate capacity of the free-flowing lane that ends with a lane-add condition is 1,600 vph. The DRI traffic analysis expects approximately 591 vehicles in the peak weekday hour, which results in a volume-to-capacity ratio of 0.4. This is well below the margin for congested LOS.

Turn Lane Storage Lengths

Turn lanes were sized using a method that considers the queue length reported in Synchro as well as a calculated queue length that is derived from the estimated number of cars that arrive within 1.5 cycles of the signal. For this determination, four scenarios were considered:

- Weekday PM peak hour
- Weekday event release hour
- Weekend peak hour
- Weekend event release hour

The PM peak hour inbound traffic is expected to produce the highest demand on the freeway off-ramp, which is the only approach of this intersection that is receiving improvements. However, to maintain consistency with the traffic engineering report for US 41/Cobb Parkway at Spring Road/Circle 75 Parkway, the PM release hour, weekend peak hour, and weekend release hour time periods were also studied for anticipated queue lengths. The hourly turning movement volumes used in the release scenarios were estimated by reversing the traffic patterns of vehicles entering the stadium during the PM peak hour, as indicated in the *DRI #2381*. During the weekday release hour, which is assumed to take place at 11 PM, a factor was applied to the background traffic and the mixed-use development traffic to account for a time of day reduction in volumes. The reversed (exiting) stadium traffic was then added on top of these reduced volumes. A similar approach was taken for weekend release traffic, but a reduction factor was not applied to background and mixed-use development traffic because of the assumption that traffic at the time of the weekend release (assumed to be 5 PM) would still be relatively

high. This approach is expected to yield a conservative estimate of total demand which is appropriate considering the variations and uncertainty that accompany traffic prediction for high-volume events. Release scenario turning movement volumes are located in the **Appendix D** of this report. The queue reports from Synchro can be found in **Appendix E**.

Results of this storage length analysis are found in **Table 5**. Note that the calculated value for storage relies on the assumption that arrival patterns are uniform and that the average length of a vehicle plus the distance between successive vehicles is 25'.

Table 5: Queue Lengths of Vehicles in Turn Lanes, Build Scenario

	PM Peak Inbound		Weekend Peak Inbound		PM Peak Outbound		Weekend Peak Outbound	
	Synchro	Calculated	Synchro	Calculated	Synchro	Calculated	Synchro	Calculated
Cobb Parkway at I-285 West Ramps								
NBL	250	393	286	387	157	189	360	**483**
SBR	870	1432	161	1341	79	827	695	**1820**
WBR	**629**	611	362	402	25	110	510	402

The northbound left turn lanes and the southbound right turn lane may exceed the available storage allowed by existing geometry in an event release scenario. The northbound left turn lanes extend back through the intersection of Cobb Parkway and the I-285 East ramps where excess queue can be stored. Conversion of this southbound right turn lane to a free-flowing lane onto the I-285 West on-ramp should be considered to improve the flow rate onto the freeway.

The off-ramp's free-flowing lane should be long enough to prevent blockage by the heavy right turn movement that is present due to weekday PM commuter traffic. As noted in **Table 5**, the maximum queue length for the right turn movement is 629'. The free-flow lane should be a minimum of 630' long to prevent blockage.

Recommendations:

Recommendations for geometric modifications to this intersection include:

- Widen the outside edge of the freeway off-ramp and construct a fourth right turn lane. This right turn lane should be at minimum 630' long. The geometry of the lane should allow for free-flow movement of traffic and should bypass both this intersection and the intersection of Cobb Parkway and Spring Road/Circle 75 Parkway. This configuration will provide direct access to Circle 75 Parkway for event traffic and other trips with a destination in the proposed mixed-use development. Due to low driver expectancy for stopping during this movement from the freeway, pedestrian crossings of this free-flow facility should be prohibited.
- Pavement markings and overhead signage should be used to direct right turns into the correct lane. Right turn lanes should line up with receiving lanes in this configuration:
    - Left-hand westbound right turn lane > middle northbound left turn lane
    - Middle westbound right turn lane > option of rightmost northbound left turn lane or the inside northbound through lane
    - Right-hand westbound right turn lane > any other northbound through lane

- Pedestrian crossings should be prohibited along the entire length of Cobb Parkway on the east side from Circle 75 Parkway to the I-285 Eastbound on-ramp due to the proposed free-flow lane between I-285 West and Circle 75 Parkway. In addition to this restriction of parallel pedestrian traffic along Cobb Parkway, the crossing of Cobb Parkway should be restricted at this intersection through signage to keep people from being able to reach the east side of the road from the west side sidewalk. Design elements such as decorative fencing and concrete barriers can be used to restrict lateral pedestrian traffic. Signage at regular intervals along Cobb Parkway's west side that indicate the prohibition of mid-block pedestrian crossings should also be employed. These measures are intended to effectively keep any pedestrian traffic from conflicting with the high-volume free-flowing traffic coming off I-285 West that will be accessing the proposed site and stadium and which will consist of drivers with a low expectancy for a stop due to pedestrians.

Traffic Engineering Report Appendix:

- Appendix A: PM and Weekend Peak Hour Turning Movement Counts
- Appendix B: 2019 Build and No-Build Synchro LOS Reports
- Appendix C: Existing and Build Scenario Lane Configuration
- Appendix D: 2019 PM and Weekend Release Hour Turning Movement Counts
- Appendix E: Synchro PM and Weekend Peak Hour and Release Hour Queue Reports

RECOMMENDED BY: _____ DATE: _____
Cobb County DOT

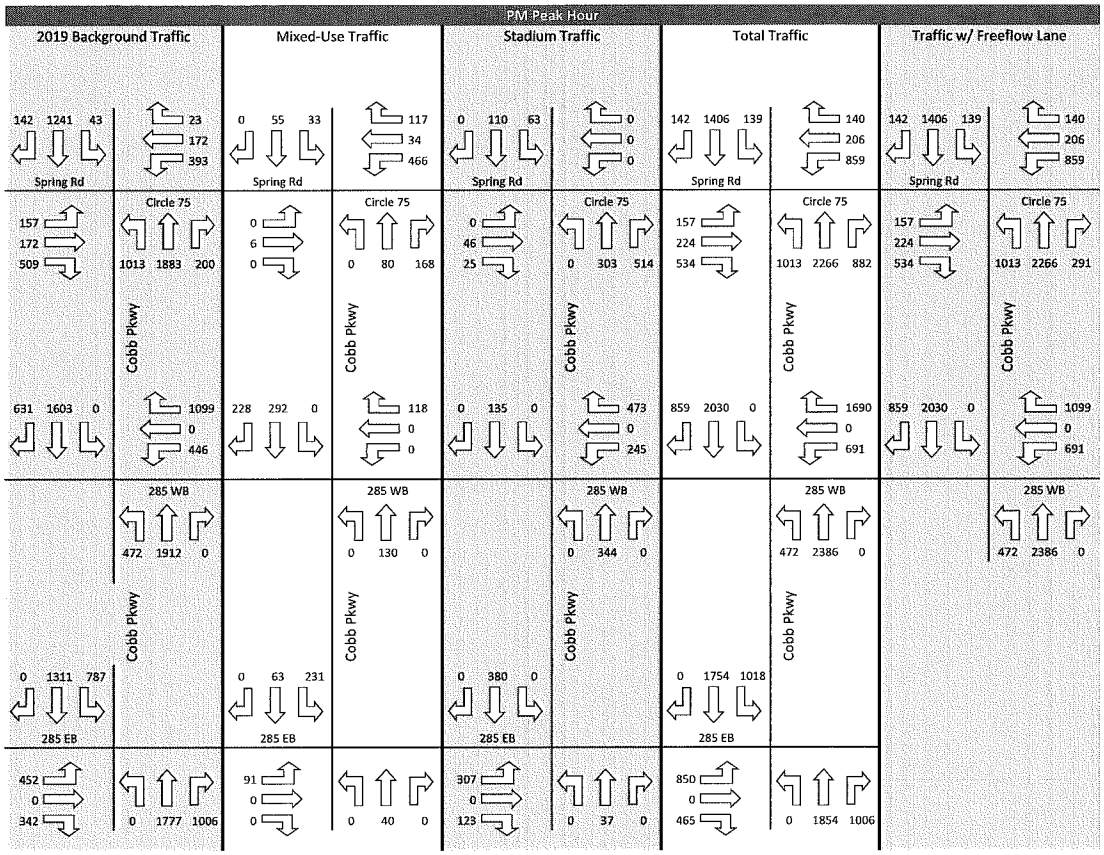
RECOMMENDED BY: _____ DATE: _____
Consulting Engineer

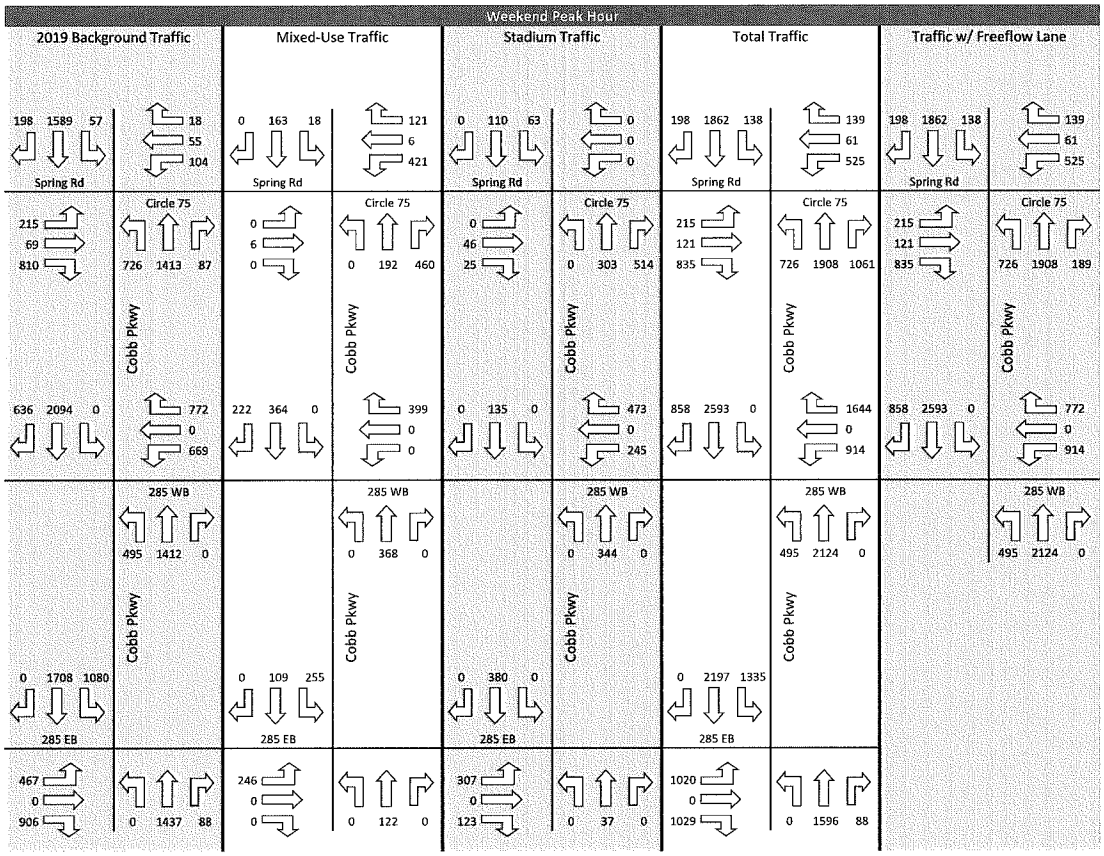
RECOMMENDED BY: _____ DATE: _____
District Traffic Engineer

RECOMMENDED BY: _____ DATE: _____
State Traffic Engineer

APPROVED BY: _____ DATE: _____
Director of Operations

Appendix A:
PM and Weekend Peak Hour Turning Movement Counts


PM Peak Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
142 1241 43
23 172 393
0 55 33
117 34 466
0 110 63
0 0 0
142 1406 139
140 206 859
157 172 509
1013 1883 200
0 6 0
0 80 168
0 46 25
0 303 514
157 224 534
1013 2266 882
631 1603 0
1099 0 446
228 292 0
118 0 0
0 135 0
473 0 245
859 2030 0
1690 0 691
472 1912 0
0 130 0
0 344 0
472 2386 0
0 1311 787
0 63 231
0 380 0
0 1754 1018
452 0 342
0 1777 1006
91 0 0
0 40 0
307 0 123
0 37 0
850 0 465
0 1854 1006
Traffic w/ Freeflow Lane
142 1406 139
140 206 859
157 224 534
1013 2266 291
859 2030 0
1099 0 691
472 2386 0


Weekend Peak Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
198 1589 57
18 55 104
0 163 18
121 6 421
0 110 63
0 0 0
198 1862 138
139 61 525
215 69 810
726 1413 87
0 6 0
0 192 460
0 46 25
0 303 514
215 121 835
726 1908 1061
636 2094 0
772 0 669
222 364 0
399 0 0
0 135 0
473 0 245
858 2593 0
1644 0 914
495 1412 0
0 368 0
0 344 0
495 2124 0
0 1708 1080
0 109 255
0 380 0
0 2197 1335
467 0 906
0 1437 88
246 0 0
0 122 0
307 0 123
0 37 0
1020 0 1029
0 1596 88
Traffic w/ Freeflow Lane
198 1862 138
139 61 525
215 121 835
726 1908 189
858 2593 0
772 0 914
495 2124 0

Attachment B:
2019 Build and No-Build Synchro LOS Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	157	224	534	859	206	140	1007	2266	882	26	113	1406
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	0.95	0.95	0.88	0.95	0.95	1.00	0.97	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1681	1764	2787	1681	1716	1583	3433	6408	1583		3433	7440
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1681	1764	2787	1681	1716	1583	3433	6408	1583		3433	7440
Peak-hour factor, PHF	0.90	0.90	0.90	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	174	249	593	965	231	157	1060	2385	928	28	120	1496
RTOR Reduction (vph)	0	0	43	0	0	138	0	0	233	0	0	11
Lane Group Flow (vph)	157	266	550	589	607	19	1060	2385	695	0	148	1636
Turn Type	Split	NA	pt+ov	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases						4			6			
Actuated Green, G (s)	19.0	19.0	77.0	19.0	19.0	19.0	51.0	80.9	80.9		11.1	41.0
Effective Green, g (s)	19.0	19.0	77.0	19.0	19.0	19.0	51.0	80.9	80.9		11.1	41.0
Actuated g/C Ratio	0.12	0.12	0.48	0.12	0.12	0.12	0.32	0.51	0.51		0.07	0.26
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	199	209	1341	199	203	187	1094	3240	800		238	1906
v/s Ratio Prot	0.09	c0.15	0.20	0.35	c0.35		c0.31	0.37			0.04	0.22
v/s Ratio Perm						0.01			c0.44			
v/c Ratio	0.79	1.27	0.41	2.96	2.99	0.10	0.97	0.74	0.87		0.62	0.86
Uniform Delay, d1	68.6	70.5	26.8	70.5	70.5	62.9	53.7	31.1	34.9		72.4	56.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.04	1.25		1.00	1.00
Incremental Delay, d2	26.4	154.6	0.2	895.4	908.7	1.1	3.5	0.1	1.3		5.0	5.3
Delay (s)	95.0	225.1	27.0	965.9	979.2	63.9	62.6	32.5	44.7		77.4	62.0
Level of Service	F	F	C	F	F	E	E	C	D		E	E
Approach Delay (s)		89.4			867.2			42.4				63.3
Approach LOS		F			F			D				E

Intersection Summary			
HCM 2000 Control Delay	183.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	112.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	142
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	151
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	691	0	1690	7	465	2386	0	0	2030
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.93	0.90	0.90
Adj. Flow (vph)	0	0	0	813	0	1988	8	500	2566	0	0	2256
RTOR Reduction (vph)	0	0	0	0	0	54	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	813	0	1934	0	508	2566	0	0	2256
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				33.0		33.0		30.0	116.0			80.0
Effective Green, g (s)				33.0		33.0		30.0	116.0			80.0
Actuated g/C Ratio				0.21		0.21		0.19	0.72			0.50
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				708		744		643	3686			3772
v/s Ratio Prot				0.24		c0.54		c0.15	0.50			0.30
v/s Ratio Perm												
v/c Ratio				1.15		2.60		0.79	0.70			0.60
Uniform Delay, d1				63.5		63.5		62.0	12.2			28.5
Progression Factor				1.00		1.00		1.41	0.21			1.71
Incremental Delay, d2				82.6		723.7		0.9	0.1			0.1
Delay (s)				146.1		787.2		88.4	2.6			48.9
Level of Service				F		F		F	A			D
Approach Delay (s)		0.0			601.1				16.8			66.0
Approach LOS		A			F				B			E

Intersection Summary			
HCM 2000 Control Delay	214.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	859
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	954
RTOR Reduction (vph)	293
Lane Group Flow (vph)	662
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	80.0
Effective Green, g (s)	80.0
Actuated g/C Ratio	0.50
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	791
v/s Ratio Prot	
v/s Ratio Perm	c0.42
v/c Ratio	0.84
Uniform Delay, d1	34.4
Progression Factor	3.06
Incremental Delay, d2	1.0
Delay (s)	106.4
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	850	0	465	0	0	0	0	1854	1006	1018	1754	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.97	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6852	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6852	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	1012	0	554	0	0	0	0	2181	1184	1028	1772	0
RTOR Reduction (vph)	0	0	65	0	0	0	0	31	245	0	0	0
Lane Group Flow (vph)	1012	0	489	0	0	0	0	2742	347	1028	1772	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	28.0		28.0					65.5	65.5	46.5	119.5	
Effective Green, g (s)	28.0		28.0					65.5	65.5	46.5	119.5	
Actuated g/C Ratio	0.18		0.18					0.41	0.41	0.29	0.75	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	873		487					2805	492	997	3797	
v/s Ratio Prot	c0.20		0.18					c0.40		c0.30	0.35	
v/s Ratio Perm									0.29			
v/c Ratio	1.16		1.00					0.98	0.71	1.03	0.47	
Uniform Delay, d1	66.0		66.0					46.5	39.2	56.8	7.9	
Progression Factor	1.00		1.00					1.00	1.00	0.95	0.12	
Incremental Delay, d2	84.4		41.7					12.5	8.2	31.4	0.3	
Delay (s)	150.4		107.7					59.0	47.5	85.0	1.2	
Level of Service	F		F					E	D	F	A	
Approach Delay (s)		135.3			0.0			57.0			32.0	
Approach LOS		F			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	63.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	121	835	525	61	139	721	1908	1061	37	101	1862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	0.95	0.95	0.88	0.95	0.95	1.00	0.97	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	0.99	1.00	0.95	0.96	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1681	1744	2787	1681	1702	1583	3433	6408	1583		3433	7435
Flt Permitted	0.95	0.99	1.00	0.95	0.96	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1681	1744	2787	1681	1702	1583	3433	6408	1583		3433	7435
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	133	918	640	74	170	759	2008	1117	39	105	1940
RTOR Reduction (vph)	0	0	48	0	0	148	0	0	298	0	0	12
Lane Group Flow (vph)	182	187	870	358	356	22	759	2008	819	0	144	2134
Turn Type	Split	NA	pt+ov	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases						4			6			
Actuated Green, G (s)	19.0	19.0	67.5	19.0	19.0	19.0	41.5	71.1	71.1		10.9	40.5
Effective Green, g (s)	19.0	19.0	67.5	19.0	19.0	19.0	41.5	71.1	71.1		10.9	40.5
Actuated g/C Ratio	0.13	0.13	0.45	0.13	0.13	0.13	0.28	0.47	0.47		0.07	0.27
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	212	220	1254	212	215	200	949	3037	750		249	2007
v/s Ratio Prot	0.11	0.11	c0.31	c0.21	0.21		0.22	0.31			0.04	0.29
v/s Ratio Perm						0.01			c0.52			
v/c Ratio	0.86	0.85	0.69	1.69	1.66	0.11	0.80	0.66	1.09		0.58	1.06
Uniform Delay, d1	64.2	64.1	33.0	65.5	65.5	58.0	50.4	30.2	39.5		67.3	54.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.68	0.66		1.00	1.00
Incremental Delay, d2	33.7	31.6	1.7	329.5	314.9	1.1	0.5	0.1	43.7		3.2	39.3
Delay (s)	97.9	95.7	34.7	395.0	380.4	59.1	50.1	20.6	69.8		70.6	94.1
Level of Service	F	F	C	F	F	E	D	C	E		E	F
Approach Delay (s)		52.5			324.5			40.5				92.6
Approach LOS		D			F			D				F

Intersection Summary			
HCM 2000 Control Delay	86.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	914	0	1644	12	483	2124	0	0	2593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	1051	0	1890	13	531	2334	0	0	2849
RTOR Reduction (vph)	0	0	0	0	0	56	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1051	0	1834	0	544	2334	0	0	2849
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				35.0		35.0		24.0	104.0			74.0
Effective Green, g (s)				35.0		35.0		24.0	104.0			74.0
Actuated g/C Ratio				0.23		0.23		0.16	0.69			0.49
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				801		842		549	3525			3721
v/s Ratio Prot				0.31		c0.51		c0.16	0.46			0.38
v/s Ratio Perm												
v/c Ratio				1.31		2.18		0.99	0.66			0.77
Uniform Delay, d1				57.5		57.5		62.9	13.0			30.9
Progression Factor				1.00		1.00		0.51	3.10			0.53
Incremental Delay, d2				149.3		534.1		24.2	0.5			0.4
Delay (s)				206.8		591.6		56.1	40.9			16.8
Level of Service				F		F		E	D			B
Approach Delay (s)		0.0			454.1				43.7			18.9
Approach LOS		A			F				D			B

Intersection Summary			
HCM 2000 Control Delay	159.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	151.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	858
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	943
RTOR Reduction (vph)	330
Lane Group Flow (vph)	613
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	74.0
Effective Green, g (s)	74.0
Actuated g/C Ratio	0.49
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	780
v/s Ratio Prot	
v/s Ratio Perm	c0.39
v/c Ratio	0.79
Uniform Delay, d1	31.4
Progression Factor	0.74
Incremental Delay, d2	2.2
Delay (s)	25.3
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1020	0	1029	0	0	0	0	1596	88	1335	2197	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7073	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7073	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	1085	0	1095	0	0	0	0	1662	92	1435	2362	0
RTOR Reduction (vph)	0	0	67	0	0	0	0	1	51	0	0	0
Lane Group Flow (vph)	1085	0	1028	0	0	0	0	1670	32	1435	2362	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	25.0		25.0					54.5	54.5	50.5	112.5	
Effective Green, g (s)	25.0		25.0					54.5	54.5	50.5	112.5	
Actuated g/C Ratio	0.17		0.17					0.36	0.36	0.34	0.75	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	831		464					2569	437	1155	3813	
v/s Ratio Prot	0.22		c0.37					0.24		c0.42	c0.46	
v/s Ratio Perm									0.03			
v/c Ratio	1.31		2.22					0.65	0.07	1.24	0.62	
Uniform Delay, d1	62.5		62.5					39.8	31.2	49.8	8.8	
Progression Factor	1.00		1.00					1.00	1.00	0.77	0.78	
Incremental Delay, d2	146.2		554.3					1.3	0.3	112.2	0.3	
Delay (s)	208.7		616.8					41.1	31.6	150.3	7.2	
Level of Service	F		F					D	C	F	A	
Approach Delay (s)		413.7			0.0			40.6			61.3	
Approach LOS		F			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	156.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	151.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	157	224	534	859	206	140	1007	2266	291	26	113	1406
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3324		4990	6408	1583		3433	7440
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3324		4990	6408	1583		3433	7440
Peak-hour factor, PHF	0.90	0.90	0.90	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	174	249	593	965	231	157	1060	2385	306	28	120	1496
RTOR Reduction (vph)	0	0	46	0	75	0	0	0	108	0	0	11
Lane Group Flow (vph)	174	249	547	965	313	0	1060	2385	198	0	148	1636
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	19.0	19.0	69.4	33.0	33.0		43.4	66.9	66.9		11.1	34.6
Effective Green, g (s)	19.0	19.0	69.4	33.0	33.0		43.4	66.9	66.9		11.1	34.6
Actuated g/C Ratio	0.12	0.12	0.43	0.21	0.21		0.27	0.42	0.42		0.07	0.22
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	210	420	1208	1029	685		1353	2679	661		238	1608
v/s Ratio Prot	c0.10	0.07	0.20	c0.19	0.09		c0.21	c0.37			0.04	c0.22
v/s Ratio Perm									0.12			
v/c Ratio	0.83	0.59	0.45	0.94	0.46		0.78	0.89	0.30		0.62	1.02
Uniform Delay, d1	68.9	66.8	31.9	62.5	55.6		54.0	43.1	31.0		72.4	62.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.02	1.06	1.23		1.00	1.00
Incremental Delay, d2	29.9	6.0	0.3	16.6	2.2		1.2	2.1	0.5		5.0	26.9
Delay (s)	98.8	72.9	32.2	79.1	57.8		56.2	47.8	38.5		77.4	89.6
Level of Service	F	E	C	E	E		E	D	D		E	F
Approach Delay (s)		53.6			73.0			49.4				88.6
Approach LOS		D			E			D				F

Intersection Summary			
HCM 2000 Control Delay	62.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	142
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	151
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	691	0	1099	7	465	2386	0	0	2030
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.93	0.90	0.90
Adj. Flow (vph)	0	0	0	813	0	1293	8	500	2566	0	0	2256
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	813	0	1249	0	508	2566	0	0	2256
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				56.0		56.0		25.0	93.0			62.0
Effective Green, g (s)				56.0		56.0		25.0	93.0			62.0
Actuated g/C Ratio				0.35		0.35		0.16	0.58			0.39
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				1201		1263		536	2955			2923
v/s Ratio Prot				0.24		c0.35		0.15	c0.50			0.30
v/s Ratio Perm												
v/c Ratio				0.68		0.99		0.95	0.87			0.77
Uniform Delay, d1				44.3		51.7		66.9	28.3			42.8
Progression Factor				1.00		1.00		1.14	0.06			0.63
Incremental Delay, d2				3.1		22.8		4.6	0.4			1.1
Delay (s)				47.4		74.5		80.5	2.0			28.2
Level of Service				D		E		F	A			C
Approach Delay (s)		0.0			64.0				14.9			45.3
Approach LOS		A			E				B			D

Intersection Summary			
HCM 2000 Control Delay	38.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	859
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	954
RTOR Reduction (vph)	464
Lane Group Flow (vph)	490
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	62.0
Effective Green, g (s)	62.0
Actuated g/C Ratio	0.39
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	613
v/s Ratio Prot	
v/s Ratio Perm	0.31
v/c Ratio	0.80
Uniform Delay, d1	43.5
Progression Factor	1.84
Incremental Delay, d2	5.7
Delay (s)	85.9
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	850	0	465	0	0	0	0	1854	1006	1018	1754	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.97	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6852	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6852	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	1012	0	554	0	0	0	0	2181	1184	1028	1772	0
RTOR Reduction (vph)	0	0	60	0	0	0	0	31	269	0	0	0
Lane Group Flow (vph)	1012	0	494	0	0	0	0	2742	323	1028	1772	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	31.0		31.0					62.0	62.0	47.0	116.5	
Effective Green, g (s)	31.0		31.0					62.0	62.0	47.0	116.5	
Actuated g/C Ratio	0.19		0.19					0.39	0.39	0.29	0.73	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	966		539					2655	466	1008	3702	
v/s Ratio Prot	c0.20		0.18					c0.40		c0.30	0.35	
v/s Ratio Perm									0.27			
v/c Ratio	1.05		0.92					1.03	0.69	1.02	0.48	
Uniform Delay, d1	64.5		63.2					49.0	41.0	56.5	9.1	
Progression Factor	1.00		1.00					1.00	1.00	0.76	0.25	
Incremental Delay, d2	42.2		22.7					26.6	8.2	27.9	0.3	
Delay (s)	106.7		85.9					75.6	49.3	71.0	2.6	
Level of Service	F		F					E	D	E	A	
Approach Delay (s)		99.4			0.0			71.0			27.7	
Approach LOS		F			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	61.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	121	835	525	61	139	721	1908	189	37	101	1862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3169		4990	6408	1583		3433	7435
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3169		4990	6408	1583		3433	7435
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	133	918	640	74	170	759	2008	199	39	105	1940
RTOR Reduction (vph)	0	0	54	0	141	0	0	0	85	0	0	13
Lane Group Flow (vph)	236	133	864	640	103	0	759	2008	114	0	144	2133
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	25.3	25.3	57.3	25.7	25.7		25.0	57.4	57.4		11.6	44.0
Effective Green, g (s)	25.3	25.3	57.3	25.7	25.7		25.0	57.4	57.4		11.6	44.0
Actuated g/C Ratio	0.17	0.17	0.38	0.17	0.17		0.17	0.38	0.38		0.08	0.29
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	298	596	1064	854	542		831	2452	605		265	2180
v/s Ratio Prot	0.13	0.04	c0.31	c0.13	0.03		0.15	c0.31			0.04	c0.29
v/s Ratio Perm									0.07			
v/c Ratio	0.79	0.22	0.81	0.75	0.19		0.91	0.82	0.19		0.54	0.98
Uniform Delay, d1	59.8	53.9	41.5	59.1	53.2		61.4	41.6	30.8		66.6	52.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.08	0.94	0.95		1.00	1.00
Incremental Delay, d2	13.4	0.2	4.8	3.6	0.2		10.0	2.1	0.4		2.3	14.8
Delay (s)	73.2	54.1	46.3	62.7	53.4		76.1	41.2	29.7		68.9	67.4
Level of Service	E	D	D	E	D		E	D	C		E	E
Approach Delay (s)		52.1			60.2			49.3				67.5
Approach LOS		D			E			D				E

Intersection Summary			
HCM 2000 Control Delay	56.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	914	0	772	12	483	2124	0	0	2593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	1051	0	887	13	531	2334	0	0	2849
RTOR Reduction (vph)	0	0	0	0	0	50	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1051	0	837	0	544	2334	0	0	2849
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				48.0		48.0		25.0	91.0			60.0
Effective Green, g (s)				48.0		48.0		25.0	91.0			60.0
Actuated g/C Ratio				0.32		0.32		0.17	0.61			0.40
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				1098		1155		572	3084			3017
v/s Ratio Prot				c0.31		0.23		c0.16	0.46			c0.38
v/s Ratio Perm												
v/c Ratio				0.96		0.72		0.95	0.76			0.94
Uniform Delay, d1				50.0		45.2		61.9	21.5			43.4
Progression Factor				1.00		1.00		1.11	0.22			0.70
Incremental Delay, d2				18.6		4.0		15.5	0.8			4.7
Delay (s)				68.6		49.1		84.1	5.5			35.0
Level of Service				E		D		F	A			C
Approach Delay (s)		0.0			59.7				20.4			37.4
Approach LOS		A			E				C			D

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	138.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	858
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	943
RTOR Reduction (vph)	433
Lane Group Flow (vph)	510
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	60.0
Effective Green, g (s)	60.0
Actuated g/C Ratio	0.40
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	633
v/s Ratio Prot	
v/s Ratio Perm	0.32
v/c Ratio	0.81
Uniform Delay, d1	39.8
Progression Factor	0.97
Incremental Delay, d2	6.1
Delay (s)	44.7
Level of Service	D
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1020	0	1029	0	0	0	0	1596	88	1335	2197	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7073	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7073	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	1085	0	1095	0	0	0	0	1662	92	1435	2362	0
RTOR Reduction (vph)	0	0	57	0	0	0	0	1	59	0	0	0
Lane Group Flow (vph)	1085	0	1038	0	0	0	0	1670	24	1435	2362	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	44.0		44.0					33.5	33.5	52.5	93.5	
Effective Green, g (s)	44.0		44.0					33.5	33.5	52.5	93.5	
Actuated g/C Ratio	0.29		0.29					0.22	0.22	0.35	0.62	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1463		817					1579	268	1201	3169	
v/s Ratio Prot	0.22		c0.37					c0.24		c0.42	0.46	
v/s Ratio Perm									0.02			
v/c Ratio	0.74		1.27					1.06	0.09	1.19	0.75	
Uniform Delay, d1	47.9		53.0					58.2	46.2	48.8	19.9	
Progression Factor	1.00		1.00					1.00	1.00	0.78	0.43	
Incremental Delay, d2	3.4		131.6					39.7	0.7	90.6	0.6	
Delay (s)	51.3		184.6					97.9	46.8	128.6	9.2	
Level of Service	D		F					F	D	F	A	
Approach Delay (s)		118.2			0.0			95.5			54.3	
Approach LOS		F			A			F			D	

Intersection Summary			
HCM 2000 Control Delay	81.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	138.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	75	810	1039	107	202	746	1715	148	37	38	2055
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3192		4990	6408	1583		3433	7445
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3192		4990	6408	1583		3433	7445
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	82	890	1267	130	246	785	1805	156	39	40	2141
RTOR Reduction (vph)	0	0	57	0	135	0	0	0	76	0	0	12
Lane Group Flow (vph)	236	82	833	1267	241	0	785	1805	80	0	79	2335
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	21.0	21.0	51.0	23.0	23.0		23.0	67.2	67.2		8.8	53.0
Effective Green, g (s)	21.0	21.0	51.0	23.0	23.0		23.0	67.2	67.2		8.8	53.0
Actuated g/C Ratio	0.14	0.14	0.34	0.15	0.15		0.15	0.45	0.45		0.06	0.35
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	247	495	947	765	489		765	2870	709		201	2630
v/s Ratio Prot	0.13	0.02	c0.30	c0.25	0.08		c0.16	0.28			0.02	c0.31
v/s Ratio Perm									0.05			
v/c Ratio	0.96	0.17	0.88	1.66	0.49		1.03	0.63	0.11		0.39	0.89
Uniform Delay, d1	64.0	56.8	46.6	63.5	58.2		63.5	31.8	24.1		68.0	45.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.04	0.63	1.04		1.00	1.00
Incremental Delay, d2	44.6	0.2	9.3	301.1	0.8		33.1	0.7	0.2		1.3	4.9
Delay (s)	108.6	56.9	55.9	364.6	59.0		99.2	20.8	25.2		69.3	50.6
Level of Service	F	E	E	F	E		F	C	C		E	D
Approach Delay (s)		66.3			294.7			43.5				51.3
Approach LOS		E			F			D				D

Intersection Summary			
HCM 2000 Control Delay	100.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	669	0	772	12	606	1915	0	0	2968
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	769	0	887	13	666	2104	0	0	3262
RTOR Reduction (vph)	0	0	0	0	0	59	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	769	0	828	0	679	2104	0	0	3262
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				29.0		29.0		25.0	110.0			79.0
Effective Green, g (s)				29.0		29.0		25.0	110.0			79.0
Actuated g/C Ratio				0.19		0.19		0.17	0.73			0.53
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				663		697		572	3729			3973
v/s Ratio Prot				0.22		c0.23		c0.20	0.41			0.43
v/s Ratio Perm												
v/c Ratio				1.16		1.19		1.19	0.56			0.82
Uniform Delay, d1				60.5		60.5		62.5	9.1			29.6
Progression Factor				1.00		1.00		1.23	0.39			0.90
Incremental Delay, d2				88.0		98.6		85.9	0.1			0.2
Delay (s)				148.5		159.1		163.1	3.6			26.9
Level of Service				F		F		F	A			C
Approach Delay (s)		0.0			154.2				42.5			55.4
Approach LOS		A			F				D			E

Intersection Summary			
HCM 2000 Control Delay	69.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	123.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	1165
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	1280
RTOR Reduction (vph)	278
Lane Group Flow (vph)	1002
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	79.0
Effective Green, g (s)	79.0
Actuated g/C Ratio	0.53
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	833
v/s Ratio Prot	
v/s Ratio Perm	c0.63
v/c Ratio	1.20
Uniform Delay, d1	35.5
Progression Factor	1.01
Incremental Delay, d2	92.3
Delay (s)	128.0
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	713	0	906	0	0	0	0	1817	333	1808	1854	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7059	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7059	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	759	0	964	0	0	0	0	1893	347	1944	1994	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	2	175	0	0	0
Lane Group Flow (vph)	759	0	903	0	0	0	0	1926	137	1944	1994	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	35.0		35.0					33.5	33.5	61.5	102.5	
Effective Green, g (s)	35.0		35.0					33.5	33.5	61.5	102.5	
Actuated g/C Ratio	0.23		0.23					0.22	0.22	0.41	0.68	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1164		650					1576	268	1407	3474	
v/s Ratio Prot	0.15		c0.32					c0.27		c0.57	0.39	
v/s Ratio Perm									0.11			
v/c Ratio	0.65		1.39					1.22	0.51	1.38	0.57	
Uniform Delay, d1	52.0		57.5					58.2	51.1	44.2	12.4	
Progression Factor	1.00		1.00					1.00	1.00	0.81	0.43	
Incremental Delay, d2	2.8		184.3					106.0	6.8	173.8	0.3	
Delay (s)	54.8		241.8					164.2	57.9	209.7	5.6	
Level of Service	D		F					F	E	F	A	
Approach Delay (s)		159.4			0.0			149.4			106.4	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM 2000 Control Delay	130.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	123.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	28	32	112	703	79	88	186	463	45	5	9	588
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3259		4990	6408	1583		3433	7502
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3259		4990	6408	1583		3433	7502
Peak-hour factor, PHF	0.90	0.90	0.90	1.00	1.00	1.00	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	31	36	124	703	79	88	196	487	47	5	10	626
RTOR Reduction (vph)	0	0	98	0	57	0	0	0	33	0	0	5
Lane Group Flow (vph)	31	36	26	703	110	0	196	487	14	0	15	645
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	15.0	15.0	24.0	46.0	46.0		2.0	38.2	38.2		0.8	37.0
Effective Green, g (s)	15.0	15.0	24.0	46.0	46.0		2.0	38.2	38.2		0.8	37.0
Actuated g/C Ratio	0.12	0.12	0.18	0.35	0.35		0.02	0.29	0.29		0.01	0.28
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	204	408	514	1765	1153		76	1882	465		21	2135
v/s Ratio Prot	c0.02	0.01	0.01	c0.14	0.03		c0.04	0.08			0.00	c0.09
v/s Ratio Perm									0.01			
v/c Ratio	0.15	0.09	0.05	0.40	0.10		2.58	0.26	0.03		0.71	0.30
Uniform Delay, d1	51.8	51.4	43.6	31.6	28.1		64.0	35.1	32.7		64.5	36.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.15	0.85	1.00		1.00	1.00
Incremental Delay, d2	1.6	0.4	0.0	0.7	0.2		747.0	0.3	0.1		75.0	0.4
Delay (s)	53.3	51.8	43.7	32.3	28.3		820.3	30.3	32.8		139.5	36.8
Level of Service	D	D	D	C	C		F	C	C		F	D
Approach Delay (s)		46.8			31.5			242.5				39.1
Approach LOS		D			C			F				D

Intersection Summary			
HCM 2000 Control Delay	97.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	23
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	24
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	98	0	198	227	502	0	0	927	496
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	6.0	7.0			7.0	7.0
Lane Util. Factor				0.97		0.76	0.97	0.91			0.81	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				3433		3610	3433	5085			7544	1583
Flt Permitted				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				3433		3610	3433	5085			7544	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	115	0	233	244	540	0	0	1030	551
RTOR Reduction (vph)	0	0	0	0	0	197	0	0	0	0	0	246
Lane Group Flow (vph)	0	0	0	115	0	36	244	540	0	0	1030	305
Turn Type				Prot		custom	Prot	NA			NA	Perm
Protected Phases				4		4	1	6			2	
Permitted Phases												2
Actuated Green, G (s)				20.0		20.0	21.0	99.0			72.0	72.0
Effective Green, g (s)				20.0		20.0	21.0	99.0			72.0	72.0
Actuated g/C Ratio				0.15		0.15	0.16	0.76			0.55	0.55
Clearance Time (s)				4.0		4.0	6.0	7.0			7.0	7.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				528		555	554	3872			4178	876
v/s Ratio Prot				c0.03		0.01	c0.07	0.11			0.14	
v/s Ratio Perm												c0.19
v/c Ratio				0.22		0.06	0.44	0.14			0.25	0.35
Uniform Delay, d1				48.2		47.0	49.2	4.1			15.0	16.0
Progression Factor				1.00		1.00	1.11	0.07			0.66	2.60
Incremental Delay, d2				0.9		0.2	2.4	0.1			0.1	1.1
Delay (s)				49.1		47.2	56.9	0.4			10.1	42.7
Level of Service				D		D	E	A			B	D
Approach Delay (s)		0.0			47.8			18.0			21.4	
Approach LOS		A			D			B			C	

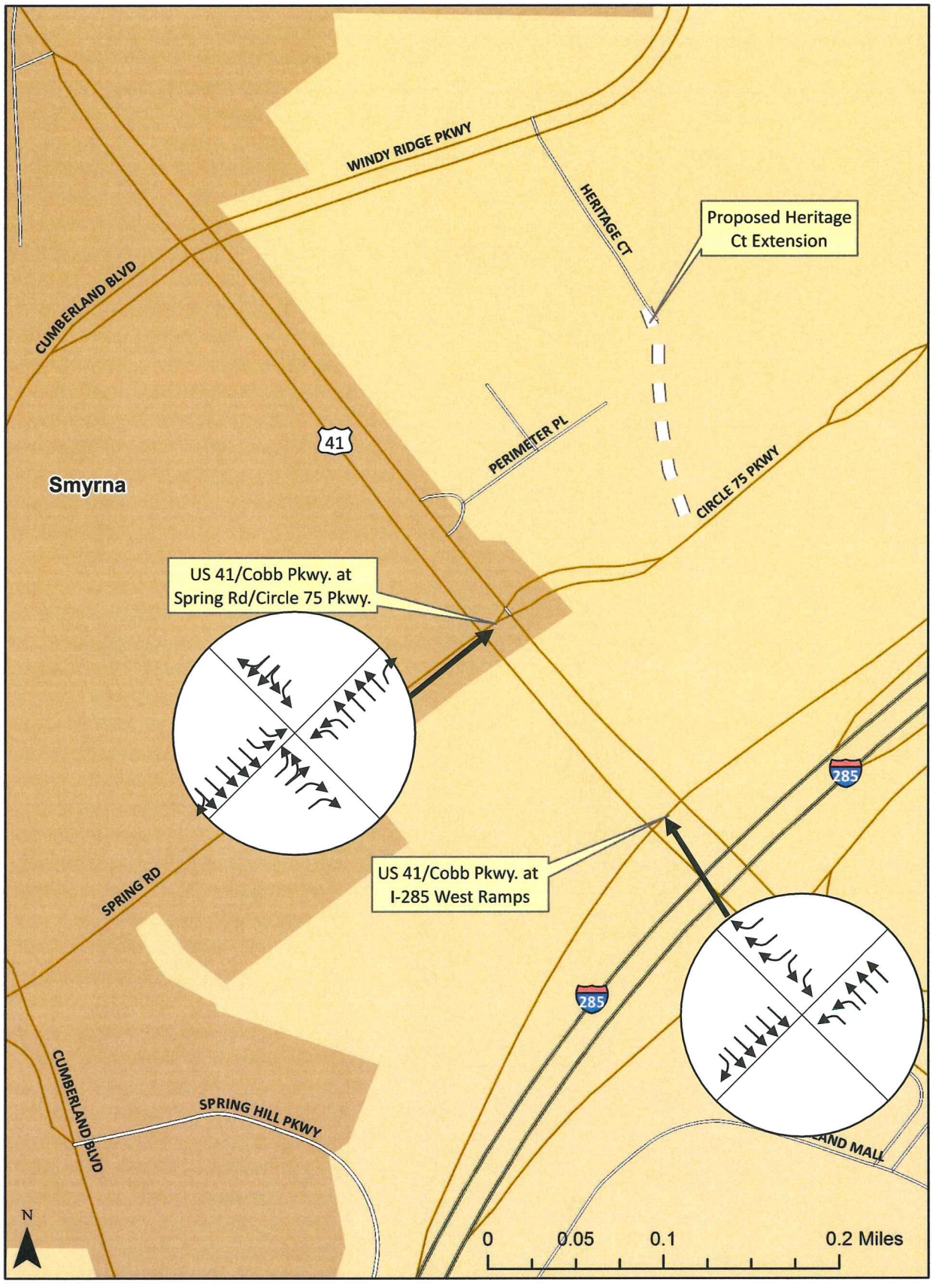
Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	0	75	0	0	0	0	585	466	697	339	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.96	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6776	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6776	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	115	0	89	0	0	0	0	688	548	704	342	0
RTOR Reduction (vph)	0	0	81	0	0	0	0	55	172	0	0	0
Lane Group Flow (vph)	115	0	8	0	0	0	0	907	102	704	342	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	12.0		12.0					48.5	48.5	49.5	105.5	
Effective Green, g (s)	12.0		12.0					48.5	48.5	49.5	105.5	
Actuated g/C Ratio	0.09		0.09					0.37	0.37	0.38	0.81	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	460		257					2527	448	1307	4126	
v/s Ratio Prot	c0.02		0.00					c0.13		c0.21	0.07	
v/s Ratio Perm									0.08			
v/c Ratio	0.25		0.03					0.36	0.23	0.54	0.08	
Uniform Delay, d1	54.8		53.7					29.5	27.9	31.4	2.5	
Progression Factor	1.00		1.00					1.00	1.00	1.31	0.50	
Incremental Delay, d2	1.3		0.2					0.4	1.2	1.6	0.0	
Delay (s)	56.1		53.9					29.9	29.1	42.6	1.3	
Level of Service	E		D					C	C	D	A	
Approach Delay (s)		55.2			0.0			29.7			29.1	
Approach LOS		E			A			C			C	

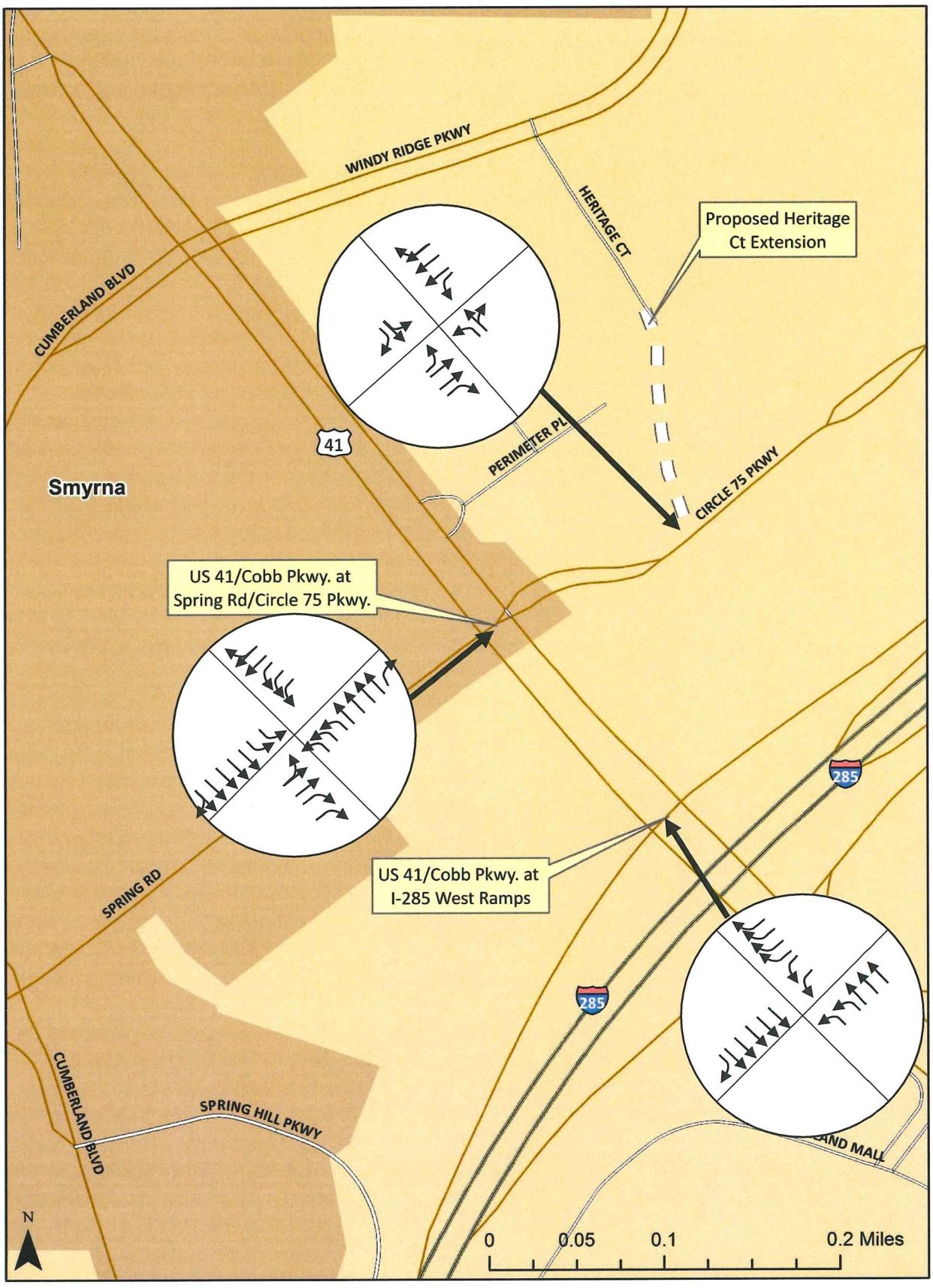
Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Attachment C:
Existing and Build Scenario Lane Configuration

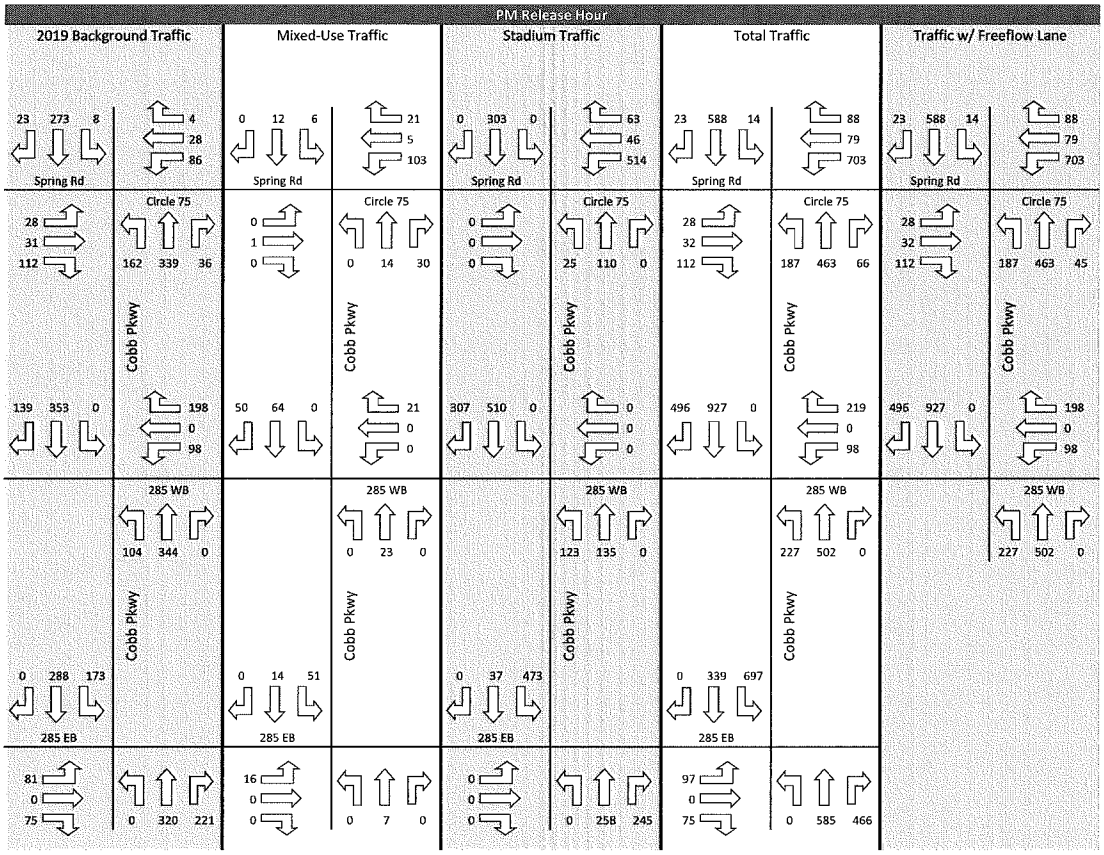
Existing Lane Configuration

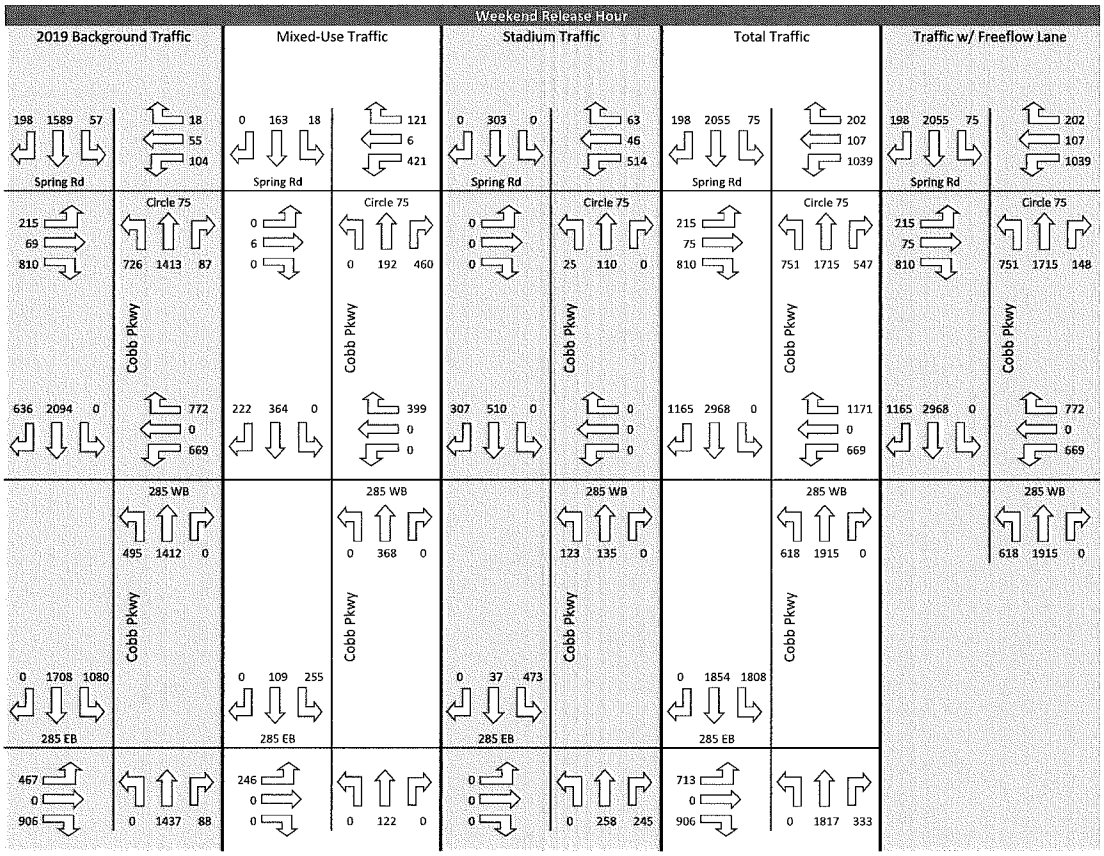


Proposed Lane Configuration



Attachment D:
2019 PM and Weekend Release Hour Turning Movement Counts


PM Release Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
23 273 8
4 28 86
0 12 6
21 5 103
0 303 0
63 46 514
23 588 14
88 79 703
28 31 112
162 339 36
0 1 0
0 14 30
0 0 0
25 110 0
28 32 112
187 463 66
187 463 45
139 353 0
198 0 98
50 64 0
21 0 0
307 510 0
0 0 0
496 927 0
219 0 98
104 344 0
0 23 0
123 135 0
227 502 0
0 288 173
0 14 51
0 37 473
0 339 697
81 0 75
16 0 0
0 320 221
0 7 0
0 0 0
0 258 245
97 0 75
0 585 466


Weekend Release Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
198 1589 57
18 55 104
0 163 18
121 6 421
0 303 0
63 46 514
198 2055 75
202 107 1039
215 69 810
726 1413 87
0 6 0
0 192 460
0 0 0
25 110 0
215 75 810
751 1715 547
751 1715 148
636 2094 0
772 0 669
222 364 0
399 0 0
307 510 0
0 0 0
1165 2968 0
1171 0 669
495 1412 0
0 368 0
123 135 0
618 1915 0
0 1708 1080
0 109 255
0 37 473
0 1854 1808
467 0 906
246 0 0
0 1437 88
0 122 0
0 0 0
0 258 245
713 0 906
0 1817 333

Attachment E:
Synchro PM and Weekend Peak Hour and Release Hour Queue Reports

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	157	266	593	589	607	157	1060	2385	928	148	1647
v/c Ratio	0.79	1.27	0.42	2.96	2.99	0.44	0.97	0.74	0.90	0.62	0.86
Control Delay	94.9	207.8	23.5	916.8	929.9	7.3	62.0	32.9	22.9	84.0	61.7
Queue Delay	0.0	0.0	0.0	1.6	1.6	0.0	6.8	8.2	38.0	0.0	0.0
Total Delay	94.9	207.8	23.5	918.4	931.5	7.3	68.9	41.0	60.9	84.0	61.7
Queue Length 50th (ft)	170	~368	192	~1115	~1152	0	566	524	458	78	405
Queue Length 95th (ft)	#296	#568	247	#1351	#1389	35	m421	m356	m186	119	445
Internal Link Dist (ft)		761			507			581			489
Turn Bay Length (ft)	320					200	450		250	380	
Base Capacity (vph)	199	209	1400	199	203	356	1094	3239	1033	257	1917
Starvation Cap Reductn	0	0	0	0	0	0	38	838	172	0	0
Spillback Cap Reductn	0	0	47	19	19	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	1.27	0.44	3.27	3.30	0.44	1.00	0.99	1.08	0.58	0.86

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	813	1988	508	2566	2256	954
v/c Ratio	1.15	2.49	0.79	0.70	0.60	0.88
Control Delay	137.3	698.6	88.9	2.7	49.1	40.6
Queue Delay	1.3	0.0	4.2	0.6	0.5	40.1
Total Delay	138.5	698.6	93.0	3.3	49.6	80.8
Queue Length 50th (ft)	~512	~1498	270	68	582	845
Queue Length 95th (ft)	#587	#1496	m263	m80	m480	m684
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	708	798	643	3686	3772	1084
Starvation Cap Reductn	0	0	77	646	912	202
Spillback Cap Reductn	122	2	0	176	874	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.39	2.50	0.90	0.84	0.79	1.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1012	554	2773	592	1028	1772
v/c Ratio	1.16	1.00	0.98	0.80	1.03	0.47
Control Delay	140.4	94.4	57.9	21.2	83.1	1.2
Queue Delay	0.0	0.0	3.0	0.0	28.2	0.3
Total Delay	140.4	94.4	60.9	21.2	111.3	1.5
Queue Length 50th (ft)	~442	~293	738	238	~601	0
Queue Length 95th (ft)	#477	#382	708	401	m#663	m0
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	873	552	2835	737	997	3797
Starvation Cap Reductn	0	0	0	0	324	1209
Spillback Cap Reductn	5	0	51	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.17	1.00	1.00	0.80	1.53	0.68

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	182	187	918	358	356	170	759	2008	1117	144	2146
v/c Ratio	0.86	0.85	0.70	1.69	1.66	0.45	0.80	0.66	1.07	0.58	1.06
Control Delay	97.6	94.8	31.8	366.9	353.2	7.2	50.0	20.8	46.4	76.9	89.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	13.9	0.0	0.0
Total Delay	97.6	94.8	31.8	366.9	353.2	7.2	50.0	21.3	60.3	76.9	89.2
Queue Length 50th (ft)	186	191	362	~536	~529	0	311	371	~889	71	~576
Queue Length 95th (ft)	#332	#333	421	#665	#660	19	m227	m314	m388	109	#697
Internal Link Dist (ft)		761			507			581			489
Turn Bay Length (ft)	320					200	450		250	380	
Base Capacity (vph)	212	221	1419	212	215	378	1075	3039	1048	274	2022
Starvation Cap Reductn	0	0	0	0	0	0	0	488	49	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.85	0.65	1.69	1.66	0.45	0.71	0.79	1.12	0.53	1.06

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	1051	1890	544	2334	2849	943
v/c Ratio	1.31	2.10	0.99	0.66	0.77	0.85
Control Delay	193.6	527.8	57.8	41.3	16.9	9.6
Queue Delay	0.7	0.0	0.0	48.4	1.6	8.9
Total Delay	194.3	527.8	57.8	89.7	18.5	18.6
Queue Length 50th (ft)	~680	~1268	281	879	308	92
Queue Length 95th (ft)	#774	#1321	m#299	m828	m187	m111
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	801	898	549	3525	3721	1111
Starvation Cap Reductn	0	0	0	2043	648	147
Spillback Cap Reductn	87	3	0	159	529	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.47	2.11	0.99	1.57	0.93	0.98

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1085	1095	1671	83	1435	2362
v/c Ratio	1.31	2.06	0.65	0.17	1.24	0.62
Control Delay	193.6	511.9	41.2	7.6	146.3	7.3
Queue Delay	0.3	0.0	48.3	0.0	0.4	3.6
Total Delay	193.9	511.9	89.5	7.6	146.7	10.8
Queue Length 50th (ft)	~481	~925	357	2	~919	309
Queue Length 95th (ft)	#574	#1078	394	51	m#890	m290
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	831	531	2569	488	1155	3813
Starvation Cap Reductn	0	0	0	0	105	1336
Spillback Cap Reductn	37	0	1063	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.37	2.06	1.11	0.17	1.37	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	249	593	965	388	1060	2385	306	148	1647
v/c Ratio	0.83	0.59	0.47	0.94	0.51	0.78	0.89	0.40	0.62	1.02
Control Delay	98.4	73.2	27.5	78.7	44.6	56.5	48.2	15.7	84.0	85.9
Queue Delay	0.0	0.0	0.0	24.5	0.0	0.0	7.9	0.0	0.0	0.0
Total Delay	98.4	73.2	27.5	103.2	44.6	56.5	56.1	15.7	84.0	85.9
Queue Length 50th (ft)	181	132	211	356	144	370	661	86	78	~445
Queue Length 95th (ft)	#312	182	247	#429	197	m384	m695	m119	119	#607
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	210	420	1400	1029	760	1590	2678	770	257	1621
Starvation Cap Reductn	0	0	0	0	0	0	287	0	0	0
Spillback Cap Reductn	0	0	1	109	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.59	0.42	1.05	0.51	0.67	1.00	0.40	0.58	1.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	813	1293	508	2566	2256	954
v/c Ratio	0.68	0.99	0.95	0.87	0.77	0.89
Control Delay	47.7	70.9	79.2	2.0	28.3	22.3
Queue Delay	0.2	38.2	0.0	17.5	6.9	6.1
Total Delay	47.9	109.1	79.2	19.5	35.2	28.5
Queue Length 50th (ft)	373	567	262	41	454	753
Queue Length 95th (ft)	415	#629	m250	m33	m468	m870
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	1201	1307	536	2955	2923	1077
Starvation Cap Reductn	0	0	0	463	281	91
Spillback Cap Reductn	58	132	0	61	634	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	1.10	0.95	1.03	0.99	0.97

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1012	554	2773	592	1028	1772
v/c Ratio	1.05	0.92	1.03	0.81	1.02	0.48
Control Delay	103.0	76.3	73.1	20.2	70.6	2.6
Queue Delay	20.7	0.0	0.0	0.0	31.6	0.3
Total Delay	123.6	76.3	73.1	20.2	102.2	2.8
Queue Length 50th (ft)	~406	288	~807	206	~584	42
Queue Length 95th (ft)	#441	#355	#747	371	#725	72
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	966	600	2685	735	1008	3702
Starvation Cap Reductn	0	0	0	0	312	1046
Spillback Cap Reductn	65	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.12	0.92	1.03	0.81	1.48	0.67

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	236	133	918	640	244	759	2008	199	144	2146
v/c Ratio	0.79	0.22	0.81	0.75	0.36	0.91	0.82	0.29	0.54	0.98
Control Delay	79.6	55.9	43.9	64.8	18.3	77.1	41.7	10.9	74.0	66.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	10.4
Total Delay	79.6	55.9	43.9	64.8	18.3	77.1	42.0	10.9	74.0	76.9
Queue Length 50th (ft)	227	60	422	211	32	248	463	25	71	512
Queue Length 95th (ft)	#382	95	530	229	58	#333	527	m74	107	#582
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	298	596	1136	931	729	831	2451	690	389	2194
Starvation Cap Reductn	0	0	0	0	0	0	98	0	0	0
Spillback Cap Reductn	0	0	1	0	0	0	0	0	0	95
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.22	0.81	0.69	0.33	0.91	0.85	0.29	0.37	1.02

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	1051	887	544	2334	2849	943
v/c Ratio	0.96	0.74	0.95	0.76	0.94	0.88
Control Delay	68.4	45.8	83.2	5.6	35.2	15.8
Queue Delay	0.0	0.0	0.0	10.5	44.8	3.0
Total Delay	68.4	45.8	83.2	16.1	80.0	18.8
Queue Length 50th (ft)	521	314	267	145	442	121
Queue Length 95th (ft)	#618	362	m#286	m84	m510	m161
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	1098	1204	572	3084	3017	1066
Starvation Cap Reductn	0	0	0	758	75	61
Spillback Cap Reductn	0	0	0	14	835	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.74	0.95	1.00	1.31	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1085	1095	1671	83	1435	2362
v/c Ratio	0.74	1.25	1.06	0.25	1.19	0.75
Control Delay	51.6	163.5	94.7	13.4	125.4	9.3
Queue Delay	0.4	0.0	0.0	0.0	2.3	8.2
Total Delay	51.9	163.5	94.7	13.4	127.8	17.5
Queue Length 50th (ft)	341	~728	~470	6	~878	134
Queue Length 95th (ft)	395	#881	#540	68	m#963	m146
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	1463	874	1579	327	1201	3169
Starvation Cap Reductn	0	0	0	0	447	791
Spillback Cap Reductn	81	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	1.25	1.06	0.25	1.90	0.99

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	31	36	124	703	167	196	487	47	15	650
v/c Ratio	0.15	0.09	0.20	0.40	0.14	2.58	0.23	0.07	0.29	0.30
Control Delay	53.9	52.1	9.0	32.4	13.9	772.2	27.9	0.5	77.0	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.9	52.1	9.0	32.4	13.9	772.2	27.9	0.5	77.0	36.5
Queue Length 50th (ft)	24	14	1	157	23	~100	60	0	6	104
Queue Length 95th (ft)	56	32	31	194	48	#155	91	0	19	129
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	204	408	632	1765	1210	76	2119	629	52	2139
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.09	0.20	0.40	0.14	2.58	0.23	0.07	0.29	0.30

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	115	233	244	540	1030	551
v/c Ratio	0.22	0.31	0.44	0.14	0.25	0.49
Control Delay	49.4	7.0	57.2	0.4	10.1	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay	49.4	7.0	57.2	0.4	10.1	4.9
Queue Length 50th (ft)	44	0	112	2	51	56
Queue Length 95th (ft)	69	25	157	2	78	79
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	528	752	554	3872	4178	1122
Starvation Cap Reductn	0	0	0	0	0	146
Spillback Cap Reductn	0	0	0	0	65	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.31	0.44	0.14	0.25	0.56

Intersection Summary

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	115	89	962	274	704	342
v/c Ratio	0.25	0.26	0.37	0.44	0.54	0.08
Control Delay	56.3	12.2	27.2	5.6	43.0	1.3
Queue Delay	0.0	0.0	0.0	0.0	14.7	0.0
Total Delay	56.3	12.2	27.2	5.6	57.7	1.3
Queue Length 50th (ft)	32	0	139	0	297	6
Queue Length 95th (ft)	50	23	155	59	356	7
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	460	340	2582	620	1307	4126
Starvation Cap Reductn	0	0	0	0	592	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.26	0.37	0.44	0.98	0.08

Intersection Summary

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	236	82	890	1267	376	785	1805	156	79	2347
v/c Ratio	0.96	0.17	0.87	1.66	0.60	1.03	0.63	0.20	0.39	0.89
Control Delay	109.9	57.8	51.6	338.6	38.1	96.5	21.0	5.9	73.2	50.5
Queue Delay	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	109.9	57.8	52.1	338.6	38.1	96.5	21.0	5.9	73.2	50.6
Queue Length 50th (ft)	233	37	425	~636	104	~295	273	18	39	530
Queue Length 95th (ft)	#406	65	528	#641	137	m#333	m276	m40	67	569
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	247	495	1023	765	624	765	2870	785	389	2642
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	17	0	0	0	0	0	0	23
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.17	0.88	1.66	0.60	1.03	0.63	0.20	0.20	0.90

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	769	887	679	2104	3262	1280
v/c Ratio	1.16	1.17	1.19	0.56	0.82	1.15
Control Delay	139.9	138.8	148.2	3.7	27.1	88.6
Queue Delay	0.0	0.0	0.0	2.3	33.5	0.2
Total Delay	139.9	138.8	148.2	6.0	60.5	88.8
Queue Length 50th (ft)	~457	~427	~418	121	467	~748
Queue Length 95th (ft)	#555	#510	m#360	m60	m460	m#695
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	663	756	572	3729	3973	1112
Starvation Cap Reductn	0	0	0	1438	394	48
Spillback Cap Reductn	0	0	0	0	925	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.16	1.17	1.19	0.92	1.07	1.20

Intersection Summary

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Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	759	964	1928	312	1944	1994
v/c Ratio	0.65	1.36	1.22	0.70	1.38	0.57
Control Delay	55.1	208.6	153.9	24.7	204.6	5.6
Queue Delay	2.4	0.0	0.0	0.0	0.8	0.7
Total Delay	57.4	208.6	153.9	24.7	205.4	6.3
Queue Length 50th (ft)	240	~668	~610	101	~1305	97
Queue Length 95th (ft)	287	#819	#678	263	m#1359	m100
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	1164	711	1577	443	1407	3474
Starvation Cap Reductn	0	0	0	0	263	990
Spillback Cap Reductn	269	0	15	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.85	1.36	1.23	0.70	1.70	0.80

Intersection Summary

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95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

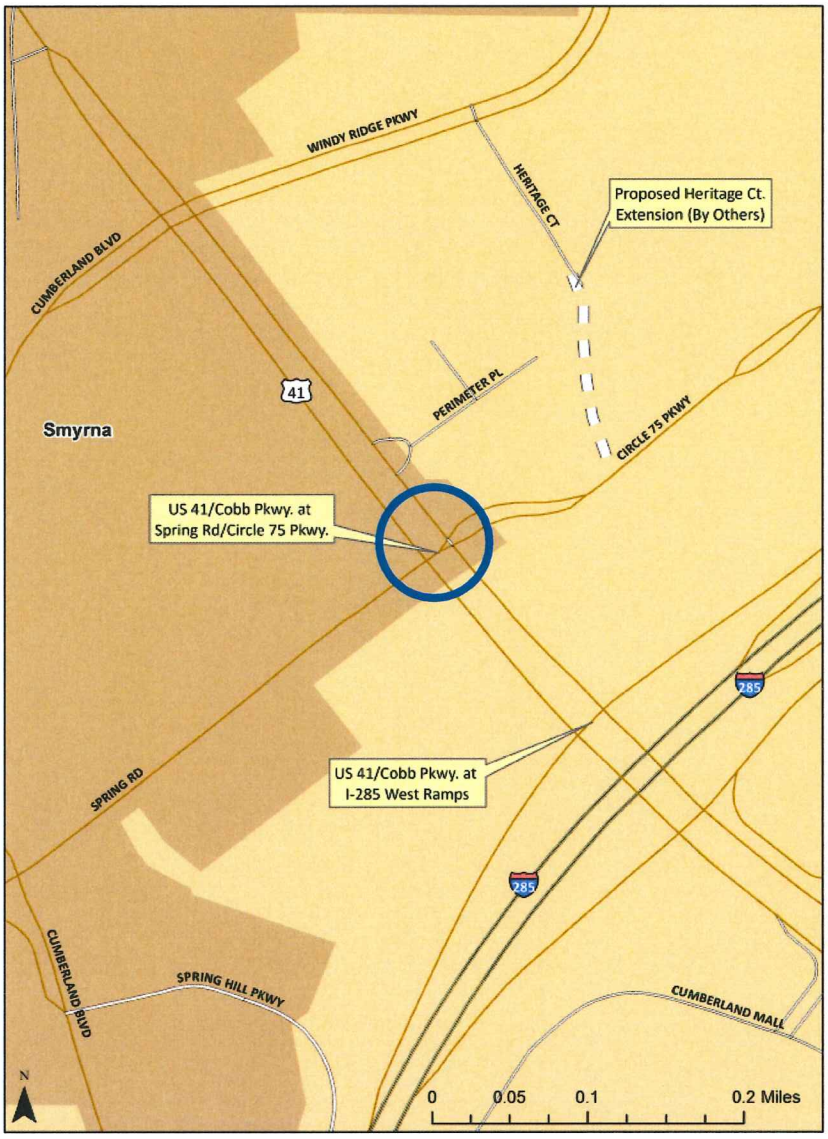
m Volume for 95th percentile queue is metered by upstream signal.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
TRAFFIC ENGINEERING REPORT

For the intersections of:

US 41/Cobb Parkway at Spring Road/Circle 75 Parkway

Cobb County At Mile log: 1.8



Report prepared by:

Richard Fangmann, P.E., Pond & Company

3500 Parkway Lane, Suite 600, Norcross, GA 30092

P: 678.336.7740

FangmannR@pondco.com

Date report prepared: April, 2015

Location:

The intersections that are investigated in this traffic study are located on US 41/Cobb Parkway in Cobb County. The study area is located northwest of the Cumberland area and it encompasses the I-285 West Off-Ramp/On-Ramp as well as one entrance to the proposed SunTrust Park Development of Regional Impact (DRI) that is proposed for the undeveloped tract between Circle 75 Parkway and Windy Ridge Parkway. In addition to the two intersections being modified, a third intersection, Cobb Parkway at I-285 East On-Ramp/Off-Ramp, was included in the study due to its proximity to the site and to the fact that trips originating on I-285 must pass through both intersections to exit the freeway on arrival and then re-enter the freeway upon the return trip. This study provides traffic engineering information and recommendations related to the intersection of US 41/Cobb Parkway and Spring Road/Circle 75 Parkway. A separate TE Report has been prepared to document recommendations related to the intersection of US 41/Cobb Parkway and the I-285 West Ramp.

Reason for the investigation:

The purpose of this study is to evaluate the benefits of proposed geometric improvements to the intersections of Cobb Parkway and Spring Road/Circle 75 Pkwy. under build traffic volumes generated by the aforementioned SunTrust Park and accompanying mixed-use development. Traffic analysis for the intersection was performed with the intent of identifying operational benefits to LOS and to determine queue storage lengths for turn lanes. Additionally, recommendations related to lane striping and signing are made in this report.

Description of the intersection:

US 41/SR 3/Cobb Parkway at Spring Road/Circle 75 Parkway

Cobb Parkway widens from a six-lane to an eight-lane highway (four-lanes, bidirectional) between this intersection and the adjacent intersection with the I-285 West ramps to the south. At the intersection, the north- and southbound approaches widen even further to include several auxiliary turn lanes. Dual northbound and southbound left turn lanes exist on Cobb Parkway while a single 150' northbound right turn lane exists for turns onto Circle 75 Pkwy from the south. A fifth southbound through lane is added to the southbound approach and aligns with the southbound left turn lane onto I-285 East further downstream.

The westbound approach of Circle 75 Parkway is a four-lane road (two lanes, bidirectional) that widens at the intersection to a shared through-right turn lane with channelization for the right turn, a shared through-left turn lane, and a dedicated left turn lane. The eastbound approach of Spring Road has three lanes in the easterly direction and two receiving lanes in the westerly direction with a flush, two-way left turn lane median. At the intersection, the three eastbound lanes widen into two right turn lanes, a shared through-left turn lane, and a dedicated left turn lane. Sidewalks are present on all four corners. Pedestrian push-buttons and signals with countdown timers are present across the north, east, and west legs of the intersection. Pedestrian crossing of Cobb Parkway on the south leg is not permitted due to conflicts with the heavy eastbound right turn during side-street green signal phases.

Traffic volumes in vehicles per day (vpd):

Daily traffic volumes for Cobb Parkway and Spring Road as found in ***Table 1*** are Georgia Department of Transportation (GDOT) traffic counts.

Table 1: Average Daily Traffic by Year from GDOT Traffic Counters

Year	Station 0672143: Cobb Parkway	Station 0672806: Spring Road
2014	42,231	34,909
2013	42,200	33,130
2012	42,070	32,970
2011	41,360	33,150
2010	40,970	33,640
2009	45,191	35,420

Peak Hour Truck Percentage: 2% (source: DRI #2381)
Daily Truck Percentage: 5% (source: 2013 GDOT Traffic Counter #2143; Cobb Parkway)

Peak hour turning movement counts for each intersection, along with the intersection of Cobb Parkway at I-285 East, were taken directly from the Development of Regional Impact (DRI) document, *Atlanta Braves Stadium and Mixed-Use Development, DRI #2381*. Additionally, the background traffic growth rate of 1% was taken from the DRI document. Use of volumes and growth assumptions from the DRI document was done to maintain consistency with the approved traffic for the site.

Peak hour turning movement counts, by intersection, can be found in **Appendix A** of this traffic engineering report.

Existing Traffic Control:

Note: Cobb Parkway at Spring Road/Circle 75 Parkway is part of a larger intelligent transportation system known as a Sydney Coordinated Adaptive Traffic System (SCATS). The SCATS is implemented on Cobb Parkway to monitor traffic presence, platoon arrival rates, pedestrian activity, and other variables for the purposes of adapting traffic signal timing in real-time to meet changing peak hour demands.

<u>US 41/Cobb Parkway at Spring Road/Circle 75 Parkway</u>

The intersection is currently signalized. The northbound and southbound left turns are protected-only. Optional phases are in use at this signal and are dependent on vehicle presence in each turn lane. The side streets are split-phased because of the shared through-left turn lanes that are present on each approach. The eastbound right turn movement is particularly heavy because of traffic making the movement to reach I-285; the signal provides an overlap phase with the northbound left turn phase of Cobb Parkway to accommodate this heavy volume. Right turns on red are allowed after stopping. Pedestrian push buttons and countdown timers are present to control north-south pedestrian traffic on Cobb Parkway and east-west pedestrian traffic on Spring Road/Circle 75 Parkway. Crosswalks across the southern leg of Cobb Parkway are not present to avoid conflicts with the heavy right turn phase.

Vehicular Speeds:

The posted speed limit on Cobb Parkway is 45 mph. The posted speed limit on Spring Road is also 45 mph while the posted speed limit on Circle 75 Parkway is 30 mph.

Pedestrian Movements:

A continuous sidewalk with crosswalks exists on the western side of Cobb Parkway from north of Spring Road/Circle 75 Pkwy. to south of the I-285 interchange. Sidewalk continues on both sides of Spring Road and Circle 75 Pkwy. and is connected to a larger system of sidewalk outside of the study area. The sidewalk on the eastern side of Cobb Parkway is discontinuous between Galleria Drive (southeast of the I-285 East ramp intersection) and the I-285 West ramp intersection. An existing "No Pedestrian" sign is in place on the east side of Cobb Parkway north of the I-285 West ramp, which suggests that pedestrian traffic on this side of Cobb Parkway near the I-285 interchange is not desired. A crosswalk is in place across the I-285 West ramp, however, and no pedestrian push buttons or signals are in place. This crosswalk and "No Pedestrians" sign send a conflicting message to pedestrians as to whether or not it is appropriate to walk in this area. A site visit revealed that pedestrians are walking in this area even where sidewalks are discontinuous and are crossing the high-volume freeway exit ramp without the aid of pedestrian signals.

Future additions to the pedestrian network in the area will include a 12' multi-use trail on the north side of Spring Road and around the entire perimeter of the SunTrust Park and mixed-use development. A proposed pedestrian bridge that spans I-285 is planned to connect the site to a Cobb Galleria Centre parking deck southeast of I-285.

The addition of the free-flow lane from I-285 West to Circle 75 Pkwy. will necessitate restricting pedestrian movements on the east side of Cobb Parkway. The crossing of a high-volume free-flowing lane of traffic by pedestrians is not recommended at this location due to the high anticipated flow and direct connection from the freeway off-ramp to the stadium. This direct connection from the I-285 West off-ramp to Circle 75 Parkway will serve traffic directly from the freeway which will have a low driver expectancy for encountering a pedestrian. Therefore pedestrians should be discouraged from entering this quadrant through design elements such as physical barriers. Physical barriers and signage prohibiting pedestrian use should be in place along the east side of Cobb Parkway between the I-285 East and West ramps and between the I-285 West off-ramp and Circle 75 Parkway.

Other Modes of Transportation Present:

Cobb County Transit (CCT) routes 10 part-time route 10A converge at the intersection of Cobb Parkway and Spring Road/Circle 75 Parkway. A CCT bus shelter is in place on the north side of Spring Road. The bus stop is potentially within an area that will undergo reconstruction, as the modified NB through-lanes are shifted back to their existing alignment, but it is not expected that the stop will be removed or relocated.

Parking:

On-street parking is not permitted in the vicinity of the study intersection.

Crash History:

The crash rates for each intersection were provided by Cobb County Department of Transportation and span a four-year period from 2011-2014. ***Table 2*** below summarizes the number of crashes, crash type, and number of injuries and fatalities.

Table 2: Crash Summary for Cobb Parkway at Spring Road/Circle 74 Parkway; 2011-2014

	Number of Crashes Involving:				Number of	Number of	Type of Crash						
Year	PDO	Injuries	Fatalities	Total	Injuries	Fatalities	Right Angle	Head On	Rear End	Sideswipe	Left Turn	Fixed Object	Other
2011	38	6	0	44	7	0	6	0	26	8	1	2	1
2012	81	23	0	104	28	0	17	0	50	23	6	2	6
2013	72	14	0	86	19	0	13	0	43	21	5	1	3
2014	31	6	0	37	6	0	11	0	14	10	0	0	2
Total	222	49	0	271	60	0	47	0	133	62	12	5	12

The most prominent crash type that occurred at this intersection in the previous four years is rear ending (49%). This is common for signalized intersections with high volumes of traffic. Sideswipe crashes were the second-most frequent crash type, making up 23% of the total crashes occurring. This is likely a result of the wide cross section and high-volume weaving maneuvers that take place on Cobb Parkway between I-285 West and Spring Road.

18% of all crashes in the most recent four-year period resulted in at least one injury. No fatalities occurred at this intersection in the reporting period.

Adjacent Signalized Intersections:

There are existing traffic signals at adjacent intersections, as indicated below.

- The next adjacent signal to the north is located 1,175' from the site at the intersection of Cobb Parkway and Windy Ridge Parkway.
- The next adjacent signal to the south is located 650' from the site at the intersection of Cobb Parkway and the I-285 West ramps.
- The next adjacent signal to the west is located 1,495' from the site at the intersection of Spring Road and Cumberland Boulevard.
- A proposed signalized intersection to the east would be located 640'-660' from the site at the intersection of Circle 75 Parkway and a proposed extension of Heritage Court.

Warrant Analysis:

A warrant analysis was not performed for this intersection. The existing traffic control is a signal.

Intersection Level of Service and Delay:

The intersection was modeled for level of service (LOS) and delay values using Synchro 8, by Trafficware. Limitations due to custom signal phasing and conflicts between U-turns and protected right turn overlap phases are present in the 2010 Highway Capacity Manual (HCM) methodology for determining LOS. As a

result, the 2000 HCM methodology was used for LOS and delay. Using this method also maintains consistency with the two studies already conducted for the site.

Existing LOS at this intersection is provided in the *DRI #2381*. That study found the 2014 existing AM, PM and Weekend LOS to be a "D", "D", and "C" respectively. This report investigates operations for both a 2019 no-build geometry and a 2019 build geometry scenario under PM peak hour and weekend peak hour conditions. Turning movement volumes remain constant between the no-build and build scenarios to identify the direct benefits to LOS and delay that are created by the proposed geometric improvements. Peak hour turning movement counts and Synchro LOS reports are found in **Appendix B**. Existing and build scenario lane configurations can be found in the **Appendix C**. Note that signal timings were obtained from Cobb County DOT for entry into Synchro models. Corridor offsets and phase splits were optimized in the build scenarios to redistribute effective green time based on the new geometry. **Table 3** documents the PM LOS and delay for the intersection and each approach by scenario. The LOS and delay during the weekend peak hour are found in **Table 4**. Note that the Build Scenario delay calculations consider the effect of zero delay conditions experienced by traffic in the free-flow lane, and as a result, the intersection and approach LOS are better than those which are reported in Synchro 8.

Table 3: 2019 PM Peak Hour LOS and Delay, No Build and Build Scenarios

PM Peak	No Build		Build	
	LOS	Delay	LOS	Delay
Cobb Pkwy. at Spring Road/Circle 75 Pkwy.				
Intersection	F	183.1	E	57.8
Northbound Approach	D	42.4	D	42.4
Southbound Approach	E	63.3	F	88.6
Eastbound Approach	F	89.4	D	53.6
Westbound Approach	F	867.2	E	73.0

Table 4: 2019 Weekend Peak Hour LOS and Delay, No Build and Build Scenarios

Weekend Peak	No Build		Build	
	LOS	Delay	LOS	Delay
Cobb Pkwy. at Spring Road/Circle 75 Pkwy.				
Intersection	F	86.7	D	50.4
Northbound Approach	D	40.5	D	37.7
Southbound Approach	F	92.6	E	67.5
Eastbound Approach	D	52.5	D	52.1
Westbound Approach	F	324.5	E	60.2

The LOS tables above indicate that the demand generated by the proposed development will result in failing LOS for the intersection during PM and weekend peak hour times. The proposed improvements are effective at improving northbound and westbound approach capacity which results in an overall improvement in LOS to an "E" range.

Westbound Lane Configuration (Circle 75 Parkway)

Exiting traffic will need to be directed into specific lanes based on its ultimate destination in advance of the intersection to minimize the potential for sideswipe crashes and to manage congestion.

The two leftmost WBL lanes should be received by the two southbound lanes on Cobb Parkway that lead to I-285 East. A high volume of traffic is expected to enter the development from I-285 West; therefore the return trips are expected to use the I-285 East interchange. Storage lengths are investigated in the next section and findings indicate that these two WBL lanes should be as long as possible to store the anticipated queues. During concept design, it was determined that the leftmost left turn lane will not meet minimum turning radii requirements for the design truck path. Therefore, trucks should be prohibited from using this inside turn lane. Turns from the other two lanes would be permitted.

The rightmost WBL lane should be marked to indicate that it provides access to I-285 West and US 41 South. This lane should be added as an auxiliary lane to the right of the middle WBL lane. It can be shorter than the two leftmost WBL lanes but still must be able to accommodate the expected number of cars without blocking the adjacent through lane. The estimated storage length for this lane is 330' (see Turn Lane Storage Lengths for more information).

The WB shared through-right turn lane is expected to be added prior to the intersection because of ROW constraints. This lane should be added to the right of the WB through lane. Its estimated length should be 250' to avoid being blocked by cars in the WB through-only lane (see Turn Lane Storage Lengths for more information).

Turn Lane Storage Lengths

Turn lanes were sized using a method that considers the queue length reported in Synchro as well as a calculated queue length that is derived from the estimated number of cars that arrive within 1.5 cycles of the signal. For this determination, four scenarios were considered:

- Weekday PM peak hour
- Weekday event release hour
- Weekend peak hour
- Weekend event release hour

The event release scenarios were included for sizing of the westbound turn lanes on Circle 75 Parkway. These lanes will be important to maintaining traffic operations at the end of a baseball game or other event and adequate storage will be needed to manage bottlenecks and the potential for blocked lanes. The hourly turning movement volumes used in the release scenarios were estimated by reversing the traffic patterns for vehicles entering the stadium during the PM peak hour, as indicated in the *DRI #2381*. During the weekday release hour, which is assumed to take place at 11 PM, a factor was applied to the background traffic and the mixed-use development traffic to account for a time of day reduction in volumes. The reversed (exiting) stadium traffic was then added on top of these reduced volumes. A similar approach was taken for weekend release traffic, but a reduction factor was not applied to background and mixed-use development traffic because of the assumption that traffic at the time of the

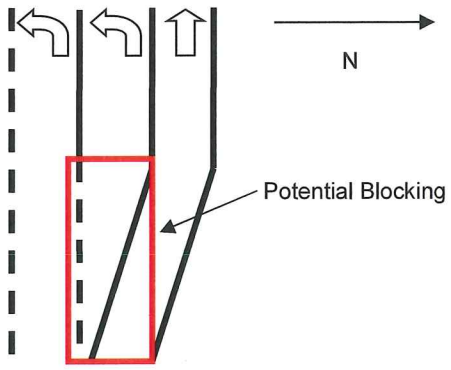
weekend release (assumed to be 5 PM) would still be relatively high. This approach is expected to yield a conservative estimate of total demand which is appropriate considering the variations and uncertainty that accompany traffic prediction for high-volume events. Release scenario turning movement volumes are found in **Appendix D** of this report. The queue reports from Synchro can be found in **Appendix E**. Results of this storage length analysis are found in **Table 5**. Note that the calculated value for storage relies on the assumption that arrival patterns are uniform and that the average length of a vehicle plus the distance between successive vehicles is 25'.

Table 5: Queue Lengths of Vehicles in Turn Lanes, Build Scenario

	PM Peak Inbound		Weekend Peak Inbound		PM Peak Outbound		Weekend Peak Outbound	
	Synchro	Calculated	Synchro	Calculated	Synchro	Calculated	Synchro	Calculated
Cobb Parkway at Spring Road/Circle 75 Parkway								
NBL	384	**618**	333	378	155	104	333	391
NBR	119	**485**	74	295	0	75	40	231
WBL	429	477	229	273	194	391	**641**	541

Note that the maximum queue lengths for the northbound left turn lane and the northbound right turn lane exceed the available storage lengths. The maximum available length for the NBL lane is approximately 470' and the maximum available length for the NBR lane is approximately 440'. The recommended design should maximize available storage length for these approaches.

The westbound left turn lanes should be at least 641' long to accommodate the expected queues created by release volumes. As noted in the previous section (Westbound Lane Configuration), the rightmost left turn lane should be indicated for vehicles using I-285 West or US 41 South. This lane can be shorter than the two lanes needed for I-285 East traffic but should be long enough to adequately hold enough cars to prevent a blockage of the adjacent through lane (see figure below).



The projected 2019 background traffic turning left from Circle 75 Parkway is 104 vph. Conservatively, if this lane is used by all of the background traffic in addition to the traffic generated by the new development that does not turn left onto I-285 East (102 vph), then the queue length that is calculated is approximately 322'. Therefore, the design length of this turn lane should be no less than 325'.

The final auxiliary lane on the westbound approach is the outside shared through-right turn lane. This lane should be designed as an added lane to the right of the through-only lane to minimize the width of the Circle 75 Parkway typical cross section. This lane will be the only option for right turns and will consist of a portion of the total through traffic. The through movement can be served by the through-only lane, so as a result, the storage length is based on the weekend release time, which has the highest number of right turning vehicles. For estimation, 40% of the through volume was assigned to this lane as well, for a total hourly demand of 244 vehicles. The calculated storage length for this lane is 254' with a minimum design length rounded up to 255'.

Recommendations:

Recommendations for geometric modifications to this intersection include:

- Restripe the existing leftmost northbound through lane into a third northbound left turn lane. This modification must be coordinated with the widening of Spring Road to ensure that three receiving lanes are present. The turn lane should be lengthened as much as possible by reconstructing the existing median on Cobb Parkway. The two existing northbound left turn lanes should also be extended to increase the total storage capacity. The approximate length of each turn lane should be 450-470', as conditions allow.
- The loss of a through lane due to its conversion into a northbound left turn lane requires that the northbound approach be widened to add the fourth northbound through lane back to the outside edge of pavement.
- The northbound right turn bay should be lengthened to approximately 460'.
- The northbound free-flowing right turn lane (from the I-285 West off-ramp) is recommended and should become a third receiving lane on Circle 75 Parkway. This allows traffic to flow directly from I-285 WB to Circle 75 Parkway. Pedestrian crossing of the south and east legs at this direct connection from I-285 West should be prohibited due to the low driver expectancy for a stop. Design elements such as decorative fencing and concrete barriers can be used to restrict pedestrian traffic.
- The westbound approach should consist of three lanes on approach that widen into five lanes (3 left turn, 1 through-only, 1 shared through-right) at the intersection. The two inside left turn lanes should extend back through the proposed intersection of Circle 75 Parkway and Heritage Court to provide adequate storage. The third left turn lane should be added to the right side of the middle left turn lane and should have a minimum full width storage length of 325' plus taper. The shared through-right turn lane should be added to the right side of the through-only lane at a minimum of 255' back from the intersection, plus taper length. Overhead signage should be incorporated into the design to inform drivers of the lane assignments well in advance of the intersection.
- Restrict the operation of heavy vehicles in the leftmost, westbound left turn lane. Overhead signage should include information about this prohibition and should direct trucks to use other lanes.

Traffic Engineering Report Appendix:

- Appendix A: PM and Weekend Peak Hour Turning Movement Counts
- Appendix B: 2019 Build and No-Build Synchro LOS Reports
- Appendix C: Existing and Build Scenario Lane Configuration
- Appendix D: 2019 PM and Weekend Release Hour Turning Movement Counts
- Appendix E: Synchro PM and Weekend Peak Hour and Release Hour Queue Reports

RECOMMENDED BY: _____ DATE: _____
Cobb County DOT

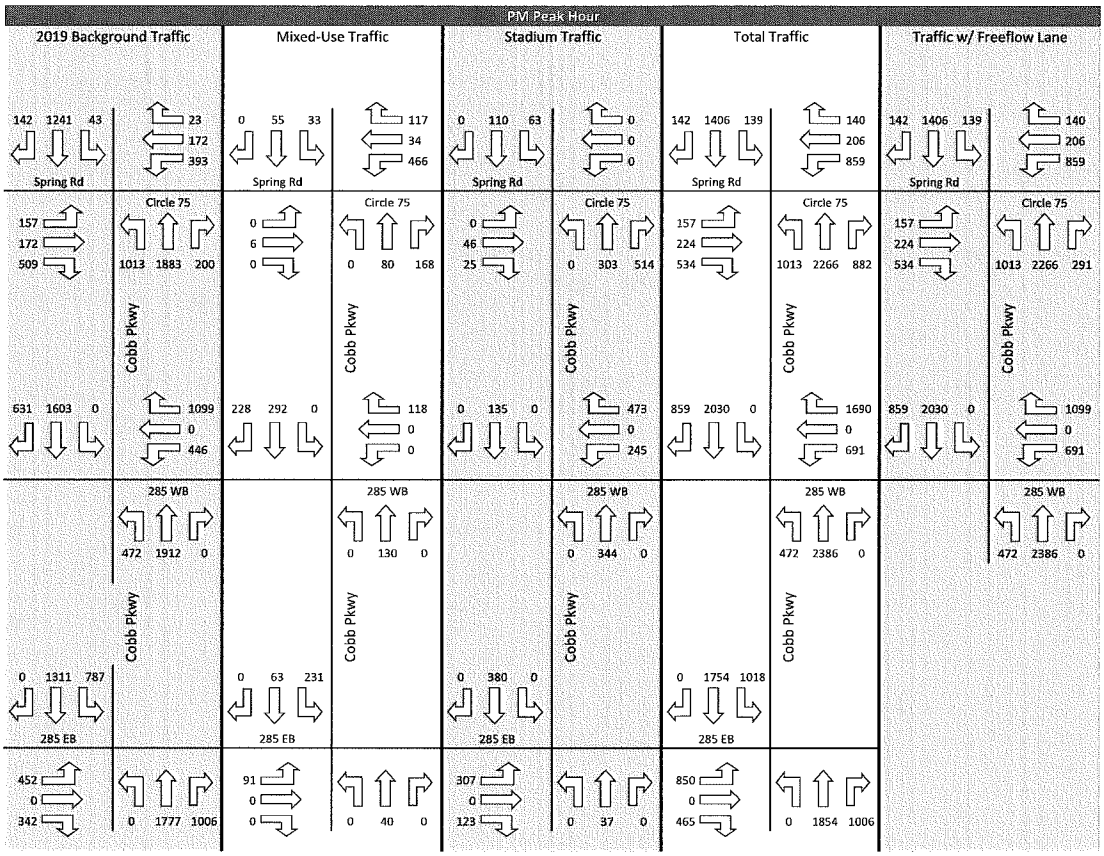
RECOMMENDED BY: _____ DATE: _____
Consulting Engineer

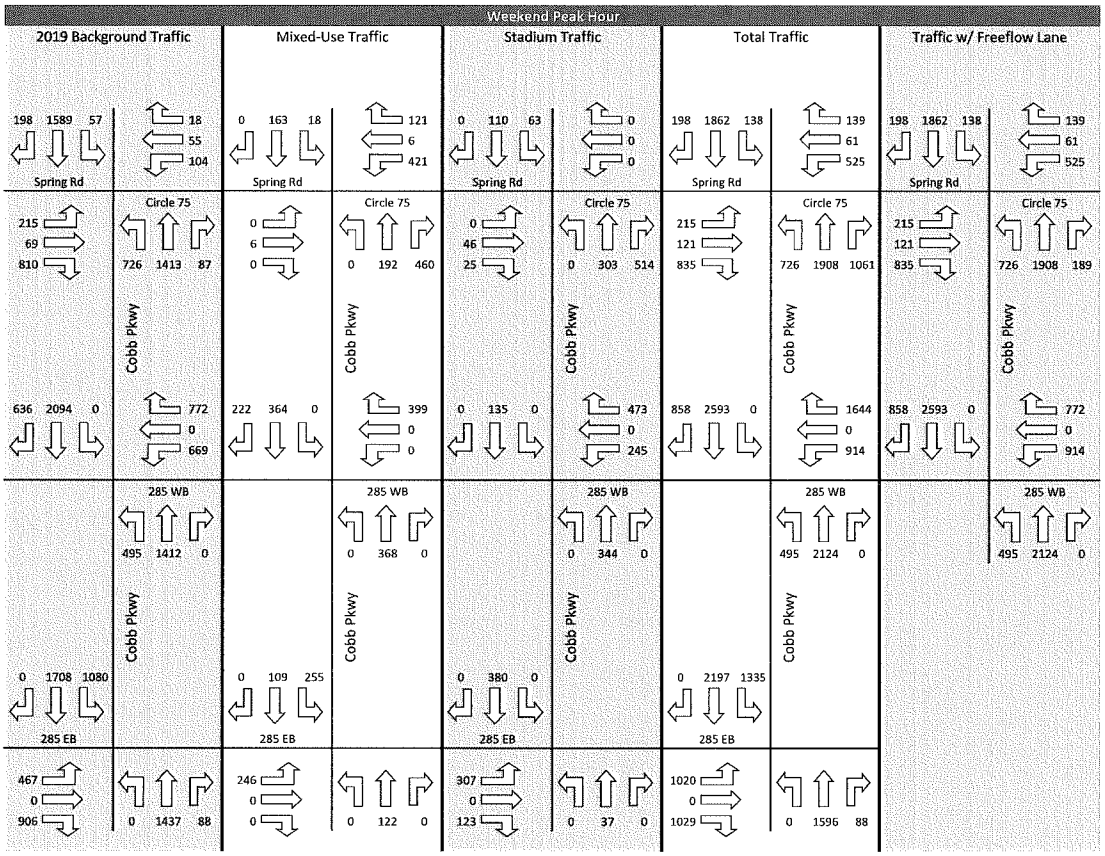
RECOMMENDED BY: _____ DATE: _____
District Traffic Engineer

RECOMMENDED BY: _____ DATE: _____
State Traffic Engineer

APPROVED BY: _____ DATE: _____
Director of Operations

Appendix A:
PM and Weekend Peak Hour Turning Movement Counts


PM Peak Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
142 1241 43
23
172
393
0 55 33
117
34
466
0 110 63
0
0
0
142 1406 139
140
206
859
142 1406 139
140
206
859
157
172
509
1013 1883 200
0
6
0
0 80 168
0
46
25
0 303 514
157
224
534
1013 2266 882
157
224
534
1013 2266 291
631 1603 0
1099
0
446
228 292 0
118
0
0
0 135 0
473
0
245
859 2030 0
1690
0
691
859 2030 0
1099
0
691
472 1912 0
0 130 0
0 344 0
472 2386 0
472 2386 0
0 1311 787
0 63 231
0 380 0
0 1754 1018
452
0
342
0 1777 1006
91
0
0
0 40 0
307
0
123
0 37 0
850
0
465
0 1854 1006


Weekend Peak Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
198 1589 57
18
55
104
0 163 18
121
6
421
0 110 63
0
0
0
198 1862 138
139
61
525
198 1862 138
139
61
525
215
69
810
726 1413 87
0
6
0
0 192 460
0
46
25
0 303 514
215
121
835
726 1908 1061
215
121
835
726 1908 189
636 2094 0
772
0
669
222 364 0
399
0
0
0 135 0
473
0
245
858 2593 0
1644
0
914
858 2593 0
772
0
914
495 1412 0
0 368 0
0 344 0
495 2124 0
495 2124 0
0 1708 1080
0 109 255
0 380 0
0 2197 1335
467
0
906
0 1437 88
246
0
0
0 122 0
307
0
123
0 37 0
1020
0
1029
0 1596 88

Attachment B:
2019 Build and No-Build Synchro LOS Reports

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	157	224	534	859	206	140	1007	2266	882	26	113	1406
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	0.95	0.95	0.88	0.95	0.95	1.00	0.97	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1681	1764	2787	1681	1716	1583	3433	6408	1583		3433	7440
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1681	1764	2787	1681	1716	1583	3433	6408	1583		3433	7440
Peak-hour factor, PHF	0.90	0.90	0.90	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	174	249	593	965	231	157	1060	2385	928	28	120	1496
RTOR Reduction (vph)	0	0	43	0	0	138	0	0	233	0	0	11
Lane Group Flow (vph)	157	266	550	589	607	19	1060	2385	695	0	148	1636
Turn Type	Split	NA	pt+ov	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases						4			6			
Actuated Green, G (s)	19.0	19.0	77.0	19.0	19.0	19.0	51.0	80.9	80.9		11.1	41.0
Effective Green, g (s)	19.0	19.0	77.0	19.0	19.0	19.0	51.0	80.9	80.9		11.1	41.0
Actuated g/C Ratio	0.12	0.12	0.48	0.12	0.12	0.12	0.32	0.51	0.51		0.07	0.26
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	199	209	1341	199	203	187	1094	3240	800		238	1906
v/s Ratio Prot	0.09	c0.15	0.20	0.35	c0.35		c0.31	0.37			0.04	0.22
v/s Ratio Perm						0.01			c0.44			
v/c Ratio	0.79	1.27	0.41	2.96	2.99	0.10	0.97	0.74	0.87		0.62	0.86
Uniform Delay, d1	68.6	70.5	26.8	70.5	70.5	62.9	53.7	31.1	34.9		72.4	56.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.04	1.25		1.00	1.00
Incremental Delay, d2	26.4	154.6	0.2	895.4	908.7	1.1	3.5	0.1	1.3		5.0	5.3
Delay (s)	95.0	225.1	27.0	965.9	979.2	63.9	62.6	32.5	44.7		77.4	62.0
Level of Service	F	F	C	F	F	E	E	C	D		E	E
Approach Delay (s)		89.4			867.2			42.4				63.3
Approach LOS		F			F			D				E

Intersection Summary			
HCM 2000 Control Delay	183.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	112.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	142
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	151
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	691	0	1690	7	465	2386	0	0	2030
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.93	0.90	0.90
Adj. Flow (vph)	0	0	0	813	0	1988	8	500	2566	0	0	2256
RTOR Reduction (vph)	0	0	0	0	0	54	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	813	0	1934	0	508	2566	0	0	2256
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				33.0		33.0		30.0	116.0			80.0
Effective Green, g (s)				33.0		33.0		30.0	116.0			80.0
Actuated g/C Ratio				0.21		0.21		0.19	0.72			0.50
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				708		744		643	3686			3772
v/s Ratio Prot				0.24		c0.54		c0.15	0.50			0.30
v/s Ratio Perm												
v/c Ratio				1.15		2.60		0.79	0.70			0.60
Uniform Delay, d1				63.5		63.5		62.0	12.2			28.5
Progression Factor				1.00		1.00		1.41	0.21			1.71
Incremental Delay, d2				82.6		723.7		0.9	0.1			0.1
Delay (s)				146.1		787.2		88.4	2.6			48.9
Level of Service				F		F		F	A			D
Approach Delay (s)		0.0			601.1				16.8			66.0
Approach LOS		A			F				B			E

Intersection Summary			
HCM 2000 Control Delay	214.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	859
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	954
RTOR Reduction (vph)	293
Lane Group Flow (vph)	662
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	80.0
Effective Green, g (s)	80.0
Actuated g/C Ratio	0.50
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	791
v/s Ratio Prot	
v/s Ratio Perm	c0.42
v/c Ratio	0.84
Uniform Delay, d1	34.4
Progression Factor	3.06
Incremental Delay, d2	1.0
Delay (s)	106.4
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	850	0	465	0	0	0	0	1854	1006	1018	1754	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.97	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6852	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6852	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	1012	0	554	0	0	0	0	2181	1184	1028	1772	0
RTOR Reduction (vph)	0	0	65	0	0	0	0	31	245	0	0	0
Lane Group Flow (vph)	1012	0	489	0	0	0	0	2742	347	1028	1772	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	28.0		28.0					65.5	65.5	46.5	119.5	
Effective Green, g (s)	28.0		28.0					65.5	65.5	46.5	119.5	
Actuated g/C Ratio	0.18		0.18					0.41	0.41	0.29	0.75	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	873		487					2805	492	997	3797	
v/s Ratio Prot	c0.20		0.18					c0.40		c0.30	0.35	
v/s Ratio Perm									0.29			
v/c Ratio	1.16		1.00					0.98	0.71	1.03	0.47	
Uniform Delay, d1	66.0		66.0					46.5	39.2	56.8	7.9	
Progression Factor	1.00		1.00					1.00	1.00	0.95	0.12	
Incremental Delay, d2	84.4		41.7					12.5	8.2	31.4	0.3	
Delay (s)	150.4		107.7					59.0	47.5	85.0	1.2	
Level of Service	F		F					E	D	F	A	
Approach Delay (s)		135.3			0.0			57.0			32.0	
Approach LOS		F			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	63.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	121	835	525	61	139	721	1908	1061	37	101	1862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	0.95	0.95	0.88	0.95	0.95	1.00	0.97	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	0.99	1.00	0.95	0.96	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1681	1744	2787	1681	1702	1583	3433	6408	1583		3433	7435
Flt Permitted	0.95	0.99	1.00	0.95	0.96	1.00	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1681	1744	2787	1681	1702	1583	3433	6408	1583		3433	7435
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	133	918	640	74	170	759	2008	1117	39	105	1940
RTOR Reduction (vph)	0	0	48	0	0	148	0	0	298	0	0	12
Lane Group Flow (vph)	182	187	870	358	356	22	759	2008	819	0	144	2134
Turn Type	Split	NA	pt+ov	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases						4			6			
Actuated Green, G (s)	19.0	19.0	67.5	19.0	19.0	19.0	41.5	71.1	71.1		10.9	40.5
Effective Green, g (s)	19.0	19.0	67.5	19.0	19.0	19.0	41.5	71.1	71.1		10.9	40.5
Actuated g/C Ratio	0.13	0.13	0.45	0.13	0.13	0.13	0.28	0.47	0.47		0.07	0.27
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	212	220	1254	212	215	200	949	3037	750		249	2007
v/s Ratio Prot	0.11	0.11	c0.31	c0.21	0.21		0.22	0.31			0.04	0.29
v/s Ratio Perm						0.01			c0.52			
v/c Ratio	0.86	0.85	0.69	1.69	1.66	0.11	0.80	0.66	1.09		0.58	1.06
Uniform Delay, d1	64.2	64.1	33.0	65.5	65.5	58.0	50.4	30.2	39.5		67.3	54.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.68	0.66		1.00	1.00
Incremental Delay, d2	33.7	31.6	1.7	329.5	314.9	1.1	0.5	0.1	43.7		3.2	39.3
Delay (s)	97.9	95.7	34.7	395.0	380.4	59.1	50.1	20.6	69.8		70.6	94.1
Level of Service	F	F	C	F	F	E	D	C	E		E	F
Approach Delay (s)		52.5			324.5			40.5				92.6
Approach LOS		D			F			D				F

Intersection Summary			
HCM 2000 Control Delay	86.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	914	0	1644	12	483	2124	0	0	2593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	1051	0	1890	13	531	2334	0	0	2849
RTOR Reduction (vph)	0	0	0	0	0	56	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1051	0	1834	0	544	2334	0	0	2849
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				35.0		35.0		24.0	104.0			74.0
Effective Green, g (s)				35.0		35.0		24.0	104.0			74.0
Actuated g/C Ratio				0.23		0.23		0.16	0.69			0.49
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				801		842		549	3525			3721
v/s Ratio Prot				0.31		c0.51		c0.16	0.46			0.38
v/s Ratio Perm												
v/c Ratio				1.31		2.18		0.99	0.66			0.77
Uniform Delay, d1				57.5		57.5		62.9	13.0			30.9
Progression Factor				1.00		1.00		0.51	3.10			0.53
Incremental Delay, d2				149.3		534.1		24.2	0.5			0.4
Delay (s)				206.8		591.6		56.1	40.9			16.8
Level of Service				F		F		E	D			B
Approach Delay (s)		0.0			454.1				43.7			18.9
Approach LOS		A			F				D			B

Intersection Summary			
HCM 2000 Control Delay	159.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	151.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	858
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	943
RTOR Reduction (vph)	330
Lane Group Flow (vph)	613
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	74.0
Effective Green, g (s)	74.0
Actuated g/C Ratio	0.49
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	780
v/s Ratio Prot	
v/s Ratio Perm	c0.39
v/c Ratio	0.79
Uniform Delay, d1	31.4
Progression Factor	0.74
Incremental Delay, d2	2.2
Delay (s)	25.3
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1020	0	1029	0	0	0	0	1596	88	1335	2197	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7073	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7073	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	1085	0	1095	0	0	0	0	1662	92	1435	2362	0
RTOR Reduction (vph)	0	0	67	0	0	0	0	1	51	0	0	0
Lane Group Flow (vph)	1085	0	1028	0	0	0	0	1670	32	1435	2362	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	25.0		25.0					54.5	54.5	50.5	112.5	
Effective Green, g (s)	25.0		25.0					54.5	54.5	50.5	112.5	
Actuated g/C Ratio	0.17		0.17					0.36	0.36	0.34	0.75	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	831		464					2569	437	1155	3813	
v/s Ratio Prot	0.22		c0.37					0.24		c0.42	c0.46	
v/s Ratio Perm									0.03			
v/c Ratio	1.31		2.22					0.65	0.07	1.24	0.62	
Uniform Delay, d1	62.5		62.5					39.8	31.2	49.8	8.8	
Progression Factor	1.00		1.00					1.00	1.00	0.77	0.78	
Incremental Delay, d2	146.2		554.3					1.3	0.3	112.2	0.3	
Delay (s)	208.7		616.8					41.1	31.6	150.3	7.2	
Level of Service	F		F					D	C	F	A	
Approach Delay (s)		413.7			0.0			40.6			61.3	
Approach LOS		F			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	156.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	151.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	157	224	534	859	206	140	1007	2266	291	26	113	1406
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3324		4990	6408	1583		3433	7440
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3324		4990	6408	1583		3433	7440
Peak-hour factor, PHF	0.90	0.90	0.90	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	174	249	593	965	231	157	1060	2385	306	28	120	1496
RTOR Reduction (vph)	0	0	46	0	75	0	0	0	108	0	0	11
Lane Group Flow (vph)	174	249	547	965	313	0	1060	2385	198	0	148	1636
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	19.0	19.0	69.4	33.0	33.0		43.4	66.9	66.9		11.1	34.6
Effective Green, g (s)	19.0	19.0	69.4	33.0	33.0		43.4	66.9	66.9		11.1	34.6
Actuated g/C Ratio	0.12	0.12	0.43	0.21	0.21		0.27	0.42	0.42		0.07	0.22
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	210	420	1208	1029	685		1353	2679	661		238	1608
v/s Ratio Prot	c0.10	0.07	0.20	c0.19	0.09		c0.21	c0.37			0.04	c0.22
v/s Ratio Perm									0.12			
v/c Ratio	0.83	0.59	0.45	0.94	0.46		0.78	0.89	0.30		0.62	1.02
Uniform Delay, d1	68.9	66.8	31.9	62.5	55.6		54.0	43.1	31.0		72.4	62.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.02	1.06	1.23		1.00	1.00
Incremental Delay, d2	29.9	6.0	0.3	16.6	2.2		1.2	2.1	0.5		5.0	26.9
Delay (s)	98.8	72.9	32.2	79.1	57.8		56.2	47.8	38.5		77.4	89.6
Level of Service	F	E	C	E	E		E	D	D		E	F
Approach Delay (s)		53.6			73.0			49.4				88.6
Approach LOS		D			E			D				F

Intersection Summary			
HCM 2000 Control Delay	62.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	142
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	151
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	691	0	1099	7	465	2386	0	0	2030
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.93	0.90	0.90
Adj. Flow (vph)	0	0	0	813	0	1293	8	500	2566	0	0	2256
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	813	0	1249	0	508	2566	0	0	2256
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				56.0		56.0		25.0	93.0			62.0
Effective Green, g (s)				56.0		56.0		25.0	93.0			62.0
Actuated g/C Ratio				0.35		0.35		0.16	0.58			0.39
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				1201		1263		536	2955			2923
v/s Ratio Prot				0.24		c0.35		0.15	c0.50			0.30
v/s Ratio Perm												
v/c Ratio				0.68		0.99		0.95	0.87			0.77
Uniform Delay, d1				44.3		51.7		66.9	28.3			42.8
Progression Factor				1.00		1.00		1.14	0.06			0.63
Incremental Delay, d2				3.1		22.8		4.6	0.4			1.1
Delay (s)				47.4		74.5		80.5	2.0			28.2
Level of Service				D		E		F	A			C
Approach Delay (s)		0.0			64.0				14.9			45.3
Approach LOS		A			E				B			D

Intersection Summary			
HCM 2000 Control Delay	38.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	859
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.90
Adj. Flow (vph)	954
RTOR Reduction (vph)	464
Lane Group Flow (vph)	490
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	62.0
Effective Green, g (s)	62.0
Actuated g/C Ratio	0.39
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	613
v/s Ratio Prot	
v/s Ratio Perm	0.31
v/c Ratio	0.80
Uniform Delay, d1	43.5
Progression Factor	1.84
Incremental Delay, d2	5.7
Delay (s)	85.9
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	850	0	465	0	0	0	0	1854	1006	1018	1754	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.97	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6852	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6852	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	1012	0	554	0	0	0	0	2181	1184	1028	1772	0
RTOR Reduction (vph)	0	0	60	0	0	0	0	31	269	0	0	0
Lane Group Flow (vph)	1012	0	494	0	0	0	0	2742	323	1028	1772	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	31.0		31.0					62.0	62.0	47.0	116.5	
Effective Green, g (s)	31.0		31.0					62.0	62.0	47.0	116.5	
Actuated g/C Ratio	0.19		0.19					0.39	0.39	0.29	0.73	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	966		539					2655	466	1008	3702	
v/s Ratio Prot	c0.20		0.18					c0.40		c0.30	0.35	
v/s Ratio Perm									0.27			
v/c Ratio	1.05		0.92					1.03	0.69	1.02	0.48	
Uniform Delay, d1	64.5		63.2					49.0	41.0	56.5	9.1	
Progression Factor	1.00		1.00					1.00	1.00	0.76	0.25	
Incremental Delay, d2	42.2		22.7					26.6	8.2	27.9	0.3	
Delay (s)	106.7		85.9					75.6	49.3	71.0	2.6	
Level of Service	F		F					E	D	E	A	
Approach Delay (s)		99.4			0.0			71.0			27.7	
Approach LOS		F			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	61.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	121	835	525	61	139	721	1908	189	37	101	1862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3169		4990	6408	1583		3433	7435
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3169		4990	6408	1583		3433	7435
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	133	918	640	74	170	759	2008	199	39	105	1940
RTOR Reduction (vph)	0	0	54	0	141	0	0	0	85	0	0	13
Lane Group Flow (vph)	236	133	864	640	103	0	759	2008	114	0	144	2133
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	25.3	25.3	57.3	25.7	25.7		25.0	57.4	57.4		11.6	44.0
Effective Green, g (s)	25.3	25.3	57.3	25.7	25.7		25.0	57.4	57.4		11.6	44.0
Actuated g/C Ratio	0.17	0.17	0.38	0.17	0.17		0.17	0.38	0.38		0.08	0.29
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	298	596	1064	854	542		831	2452	605		265	2180
v/s Ratio Prot	0.13	0.04	c0.31	c0.13	0.03		0.15	c0.31			0.04	c0.29
v/s Ratio Perm									0.07			
v/c Ratio	0.79	0.22	0.81	0.75	0.19		0.91	0.82	0.19		0.54	0.98
Uniform Delay, d1	59.8	53.9	41.5	59.1	53.2		61.4	41.6	30.8		66.6	52.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.08	0.94	0.95		1.00	1.00
Incremental Delay, d2	13.4	0.2	4.8	3.6	0.2		10.0	2.1	0.4		2.3	14.8
Delay (s)	73.2	54.1	46.3	62.7	53.4		76.1	41.2	29.7		68.9	67.4
Level of Service	E	D	D	E	D		E	D	C		E	E
Approach Delay (s)		52.1			60.2			49.3				67.5
Approach LOS		D			E			D				E

Intersection Summary			
HCM 2000 Control Delay	56.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	914	0	772	12	483	2124	0	0	2593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	1051	0	887	13	531	2334	0	0	2849
RTOR Reduction (vph)	0	0	0	0	0	50	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1051	0	837	0	544	2334	0	0	2849
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				48.0		48.0		25.0	91.0			60.0
Effective Green, g (s)				48.0		48.0		25.0	91.0			60.0
Actuated g/C Ratio				0.32		0.32		0.17	0.61			0.40
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				1098		1155		572	3084			3017
v/s Ratio Prot				c0.31		0.23		c0.16	0.46			c0.38
v/s Ratio Perm												
v/c Ratio				0.96		0.72		0.95	0.76			0.94
Uniform Delay, d1				50.0		45.2		61.9	21.5			43.4
Progression Factor				1.00		1.00		1.11	0.22			0.70
Incremental Delay, d2				18.6		4.0		15.5	0.8			4.7
Delay (s)				68.6		49.1		84.1	5.5			35.0
Level of Service				E		D		F	A			C
Approach Delay (s)		0.0			59.7				20.4			37.4
Approach LOS		A			E				C			D

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	138.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	858
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	943
RTOR Reduction (vph)	433
Lane Group Flow (vph)	510
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	60.0
Effective Green, g (s)	60.0
Actuated g/C Ratio	0.40
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	633
v/s Ratio Prot	
v/s Ratio Perm	0.32
v/c Ratio	0.81
Uniform Delay, d1	39.8
Progression Factor	0.97
Incremental Delay, d2	6.1
Delay (s)	44.7
Level of Service	D
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1020	0	1029	0	0	0	0	1596	88	1335	2197	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7073	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7073	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	1085	0	1095	0	0	0	0	1662	92	1435	2362	0
RTOR Reduction (vph)	0	0	57	0	0	0	0	1	59	0	0	0
Lane Group Flow (vph)	1085	0	1038	0	0	0	0	1670	24	1435	2362	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	44.0		44.0					33.5	33.5	52.5	93.5	
Effective Green, g (s)	44.0		44.0					33.5	33.5	52.5	93.5	
Actuated g/C Ratio	0.29		0.29					0.22	0.22	0.35	0.62	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1463		817					1579	268	1201	3169	
v/s Ratio Prot	0.22		c0.37					c0.24		c0.42	0.46	
v/s Ratio Perm									0.02			
v/c Ratio	0.74		1.27					1.06	0.09	1.19	0.75	
Uniform Delay, d1	47.9		53.0					58.2	46.2	48.8	19.9	
Progression Factor	1.00		1.00					1.00	1.00	0.78	0.43	
Incremental Delay, d2	3.4		131.6					39.7	0.7	90.6	0.6	
Delay (s)	51.3		184.6					97.9	46.8	128.6	9.2	
Level of Service	D		F					F	D	F	A	
Approach Delay (s)		118.2			0.0			95.5			54.3	
Approach LOS		F			A			F			D	

Intersection Summary			
HCM 2000 Control Delay	81.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	138.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	215	75	810	1039	107	202	746	1715	148	37	38	2055
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.90		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3192		4990	6408	1583		3433	7445
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3192		4990	6408	1583		3433	7445
Peak-hour factor, PHF	0.91	0.91	0.91	0.82	0.82	0.82	0.95	0.95	0.95	0.96	0.96	0.96
Adj. Flow (vph)	236	82	890	1267	130	246	785	1805	156	39	40	2141
RTOR Reduction (vph)	0	0	57	0	135	0	0	0	76	0	0	12
Lane Group Flow (vph)	236	82	833	1267	241	0	785	1805	80	0	79	2335
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	21.0	21.0	51.0	23.0	23.0		23.0	67.2	67.2		8.8	53.0
Effective Green, g (s)	21.0	21.0	51.0	23.0	23.0		23.0	67.2	67.2		8.8	53.0
Actuated g/C Ratio	0.14	0.14	0.34	0.15	0.15		0.15	0.45	0.45		0.06	0.35
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	247	495	947	765	489		765	2870	709		201	2630
v/s Ratio Prot	0.13	0.02	c0.30	c0.25	0.08		c0.16	0.28			0.02	c0.31
v/s Ratio Perm									0.05			
v/c Ratio	0.96	0.17	0.88	1.66	0.49		1.03	0.63	0.11		0.39	0.89
Uniform Delay, d1	64.0	56.8	46.6	63.5	58.2		63.5	31.8	24.1		68.0	45.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.04	0.63	1.04		1.00	1.00
Incremental Delay, d2	44.6	0.2	9.3	301.1	0.8		33.1	0.7	0.2		1.3	4.9
Delay (s)	108.6	56.9	55.9	364.6	59.0		99.2	20.8	25.2		69.3	50.6
Level of Service	F	E	E	F	E		F	C	C		E	D
Approach Delay (s)		66.3			294.7			43.5				51.3
Approach LOS		E			F			D				D

Intersection Summary			
HCM 2000 Control Delay	100.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	198
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.96
Adj. Flow (vph)	206
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Volume (vph)	0	0	0	669	0	772	12	606	1915	0	0	2968
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		6.0	7.0			7.0
Lane Util. Factor				0.97		0.76		0.97	0.91			0.81
Frt				1.00		0.85		1.00	1.00			1.00
Flt Protected				0.95		1.00		0.95	1.00			1.00
Satd. Flow (prot)				3433		3610		3433	5085			7544
Flt Permitted				0.95		1.00		0.95	1.00			1.00
Satd. Flow (perm)				3433		3610		3433	5085			7544
Peak-hour factor, PHF	0.92	0.92	0.92	0.87	0.87	0.87	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	769	0	887	13	666	2104	0	0	3262
RTOR Reduction (vph)	0	0	0	0	0	59	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	769	0	828	0	679	2104	0	0	3262
Turn Type				Prot		custom	Prot	Prot	NA			NA
Protected Phases				4		4	1	1	6			2
Permitted Phases												
Actuated Green, G (s)				29.0		29.0		25.0	110.0			79.0
Effective Green, g (s)				29.0		29.0		25.0	110.0			79.0
Actuated g/C Ratio				0.19		0.19		0.17	0.73			0.53
Clearance Time (s)				4.0		4.0		6.0	7.0			7.0
Vehicle Extension (s)				3.0		3.0		3.0	3.0			3.0
Lane Grp Cap (vph)				663		697		572	3729			3973
v/s Ratio Prot				0.22		c0.23		c0.20	0.41			0.43
v/s Ratio Perm												
v/c Ratio				1.16		1.19		1.19	0.56			0.82
Uniform Delay, d1				60.5		60.5		62.5	9.1			29.6
Progression Factor				1.00		1.00		1.23	0.39			0.90
Incremental Delay, d2				88.0		98.6		85.9	0.1			0.2
Delay (s)				148.5		159.1		163.1	3.6			26.9
Level of Service				F		F		F	A			C
Approach Delay (s)		0.0			154.2				42.5			55.4
Approach LOS		A			F				D			E

Intersection Summary			
HCM 2000 Control Delay	69.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	123.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	1165
Ideal Flow (vphpl)	1900
Total Lost time (s)	7.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.91
Adj. Flow (vph)	1280
RTOR Reduction (vph)	278
Lane Group Flow (vph)	1002
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	79.0
Effective Green, g (s)	79.0
Actuated g/C Ratio	0.53
Clearance Time (s)	7.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	833
v/s Ratio Prot	
v/s Ratio Perm	c0.63
v/c Ratio	1.20
Uniform Delay, d1	35.5
Progression Factor	1.01
Incremental Delay, d2	92.3
Delay (s)	128.0
Level of Service	F
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	713	0	906	0	0	0	0	1817	333	1808	1854	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					7059	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					7059	1203	3433	5085	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.96	0.96	0.96	0.93	0.93	0.93
Adj. Flow (vph)	759	0	964	0	0	0	0	1893	347	1944	1994	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	2	175	0	0	0
Lane Group Flow (vph)	759	0	903	0	0	0	0	1926	137	1944	1994	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	35.0		35.0					33.5	33.5	61.5	102.5	
Effective Green, g (s)	35.0		35.0					33.5	33.5	61.5	102.5	
Actuated g/C Ratio	0.23		0.23					0.22	0.22	0.41	0.68	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1164		650					1576	268	1407	3474	
v/s Ratio Prot	0.15		c0.32					c0.27		c0.57	0.39	
v/s Ratio Perm									0.11			
v/c Ratio	0.65		1.39					1.22	0.51	1.38	0.57	
Uniform Delay, d1	52.0		57.5					58.2	51.1	44.2	12.4	
Progression Factor	1.00		1.00					1.00	1.00	0.81	0.43	
Incremental Delay, d2	2.8		184.3					106.0	6.8	173.8	0.3	
Delay (s)	54.8		241.8					164.2	57.9	209.7	5.6	
Level of Service	D		F					F	E	F	A	
Approach Delay (s)		159.4			0.0			149.4			106.4	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM 2000 Control Delay	130.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	123.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Volume (vph)	28	32	112	703	79	88	186	463	45	5	9	588
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0		8.0	8.0	8.0		8.0	8.0
Lane Util. Factor	1.00	0.95	0.88	0.94	0.95		0.94	0.86	1.00		0.97	0.81
Frt	1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85		1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	3539	2787	4990	3259		4990	6408	1583		3433	7502
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	3539	2787	4990	3259		4990	6408	1583		3433	7502
Peak-hour factor, PHF	0.90	0.90	0.90	1.00	1.00	1.00	0.95	0.95	0.95	0.94	0.94	0.94
Adj. Flow (vph)	31	36	124	703	79	88	196	487	47	5	10	626
RTOR Reduction (vph)	0	0	98	0	57	0	0	0	33	0	0	5
Lane Group Flow (vph)	31	36	26	703	110	0	196	487	14	0	15	645
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	8	8	8 1	4	4		1	6		5	5	2
Permitted Phases									6			
Actuated Green, G (s)	15.0	15.0	24.0	46.0	46.0		2.0	38.2	38.2		0.8	37.0
Effective Green, g (s)	15.0	15.0	24.0	46.0	46.0		2.0	38.2	38.2		0.8	37.0
Actuated g/C Ratio	0.12	0.12	0.18	0.35	0.35		0.02	0.29	0.29		0.01	0.28
Clearance Time (s)	7.0	7.0		7.0	7.0		8.0	8.0	8.0		8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	204	408	514	1765	1153		76	1882	465		21	2135
v/s Ratio Prot	c0.02	0.01	0.01	c0.14	0.03		c0.04	0.08			0.00	c0.09
v/s Ratio Perm									0.01			
v/c Ratio	0.15	0.09	0.05	0.40	0.10		2.58	0.26	0.03		0.71	0.30
Uniform Delay, d1	51.8	51.4	43.6	31.6	28.1		64.0	35.1	32.7		64.5	36.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.15	0.85	1.00		1.00	1.00
Incremental Delay, d2	1.6	0.4	0.0	0.7	0.2		747.0	0.3	0.1		75.0	0.4
Delay (s)	53.3	51.8	43.7	32.3	28.3		820.3	30.3	32.8		139.5	36.8
Level of Service	D	D	D	C	C		F	C	C		F	D
Approach Delay (s)		46.8			31.5			242.5				39.1
Approach LOS		D			C			F				D

Intersection Summary			
HCM 2000 Control Delay	97.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Volume (vph)	23
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	24
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	98	0	198	227	502	0	0	927	496
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	6.0	7.0			7.0	7.0
Lane Util. Factor				0.97		0.76	0.97	0.91			0.81	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				3433		3610	3433	5085			7544	1583
Flt Permitted				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				3433		3610	3433	5085			7544	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	115	0	233	244	540	0	0	1030	551
RTOR Reduction (vph)	0	0	0	0	0	197	0	0	0	0	0	246
Lane Group Flow (vph)	0	0	0	115	0	36	244	540	0	0	1030	305
Turn Type				Prot		custom	Prot	NA			NA	Perm
Protected Phases				4		4	1	6			2	
Permitted Phases												2
Actuated Green, G (s)				20.0		20.0	21.0	99.0			72.0	72.0
Effective Green, g (s)				20.0		20.0	21.0	99.0			72.0	72.0
Actuated g/C Ratio				0.15		0.15	0.16	0.76			0.55	0.55
Clearance Time (s)				4.0		4.0	6.0	7.0			7.0	7.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				528		555	554	3872			4178	876
v/s Ratio Prot				c0.03		0.01	c0.07	0.11			0.14	
v/s Ratio Perm												c0.19
v/c Ratio				0.22		0.06	0.44	0.14			0.25	0.35
Uniform Delay, d1				48.2		47.0	49.2	4.1			15.0	16.0
Progression Factor				1.00		1.00	1.11	0.07			0.66	2.60
Incremental Delay, d2				0.9		0.2	2.4	0.1			0.1	1.1
Delay (s)				49.1		47.2	56.9	0.4			10.1	42.7
Level of Service				D		D	E	A			B	D
Approach Delay (s)		0.0			47.8			18.0			21.4	
Approach LOS		A			D			B			C	

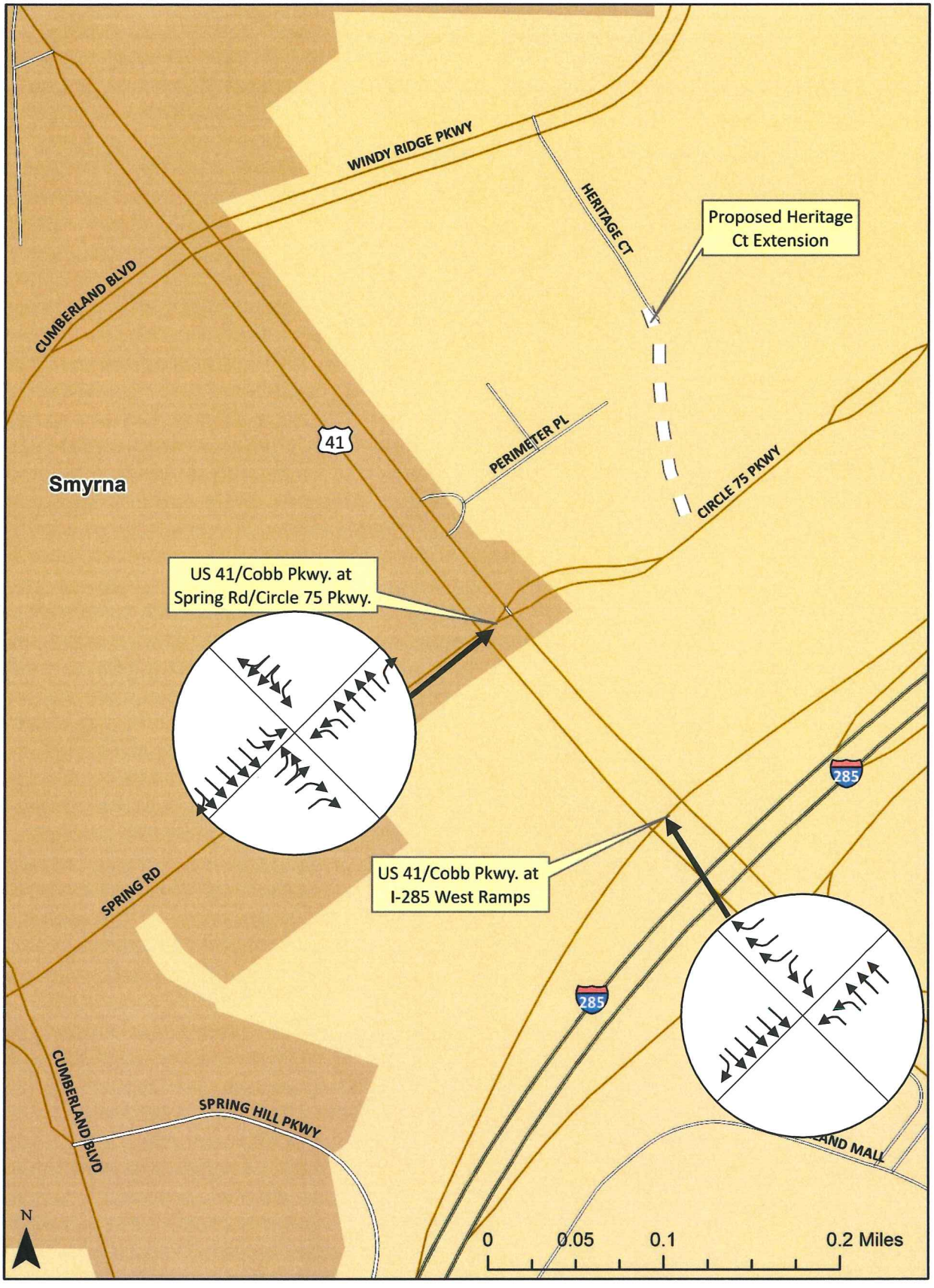
Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	0	75	0	0	0	0	585	466	697	339	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Lane Util. Factor	0.94		0.88					0.76	0.76	0.97	0.91	
Frt	1.00		0.85					0.96	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	4990		2787					6776	1203	3433	5085	
Flt Permitted	0.95		1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	4990		2787					6776	1203	3433	5085	
Peak-hour factor, PHF	0.84	0.84	0.84	0.92	0.92	0.92	0.85	0.85	0.85	0.99	0.99	0.99
Adj. Flow (vph)	115	0	89	0	0	0	0	688	548	704	342	0
RTOR Reduction (vph)	0	0	81	0	0	0	0	55	172	0	0	0
Lane Group Flow (vph)	115	0	8	0	0	0	0	907	102	704	342	0
Turn Type	Prot		custom					NA	Perm	Prot	NA	
Protected Phases	8		8					6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	12.0		12.0					48.5	48.5	49.5	105.5	
Effective Green, g (s)	12.0		12.0					48.5	48.5	49.5	105.5	
Actuated g/C Ratio	0.09		0.09					0.37	0.37	0.38	0.81	
Clearance Time (s)	6.0		6.0					6.5	6.5	7.5	6.5	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	460		257					2527	448	1307	4126	
v/s Ratio Prot	c0.02		0.00					c0.13		c0.21	0.07	
v/s Ratio Perm									0.08			
v/c Ratio	0.25		0.03					0.36	0.23	0.54	0.08	
Uniform Delay, d1	54.8		53.7					29.5	27.9	31.4	2.5	
Progression Factor	1.00		1.00					1.00	1.00	1.31	0.50	
Incremental Delay, d2	1.3		0.2					0.4	1.2	1.6	0.0	
Delay (s)	56.1		53.9					29.9	29.1	42.6	1.3	
Level of Service	E		D					C	C	D	A	
Approach Delay (s)		55.2			0.0			29.7			29.1	
Approach LOS		E			A			C			C	

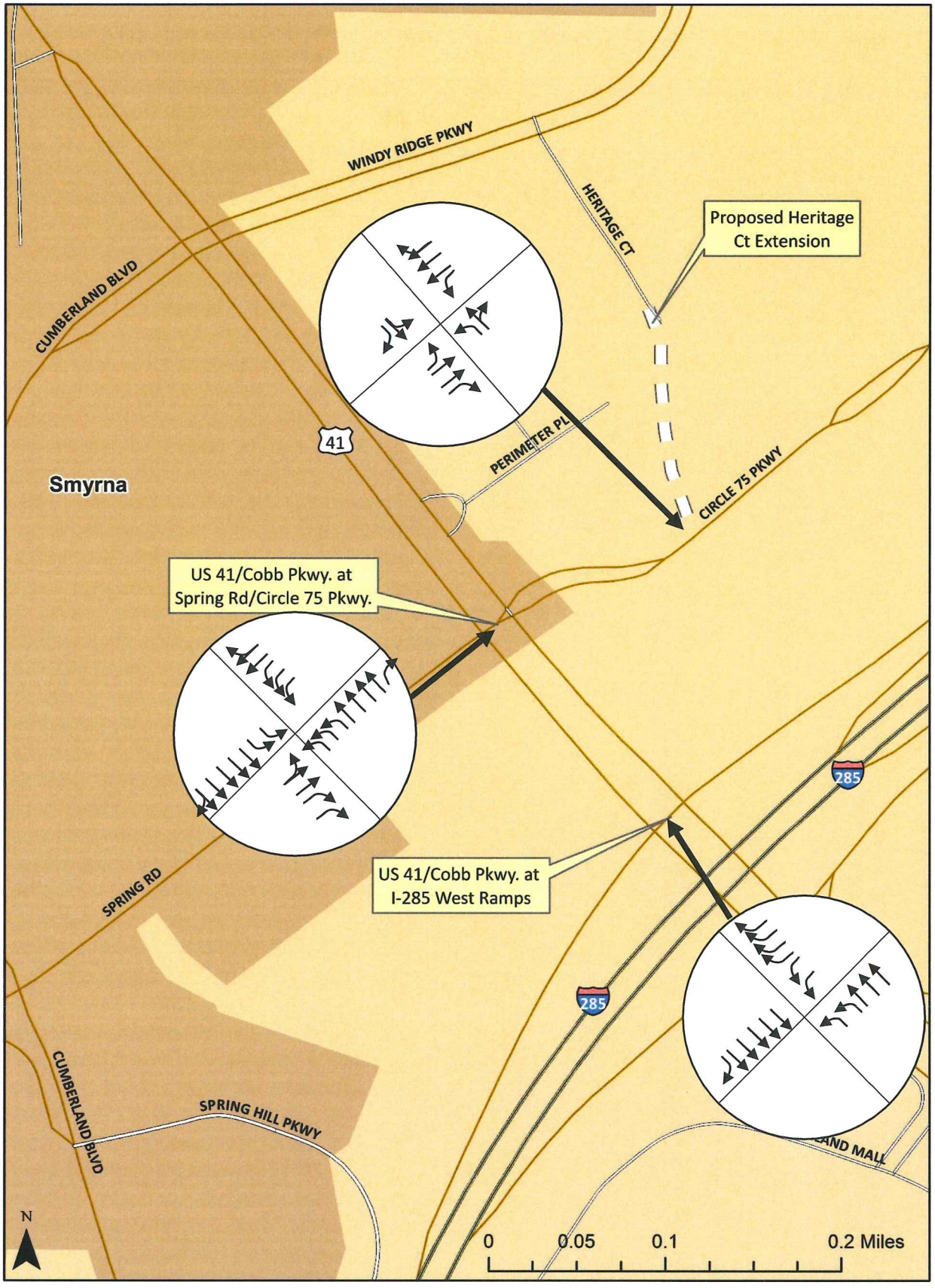
Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Attachment C:
Existing and Build Scenario Lane Configuration

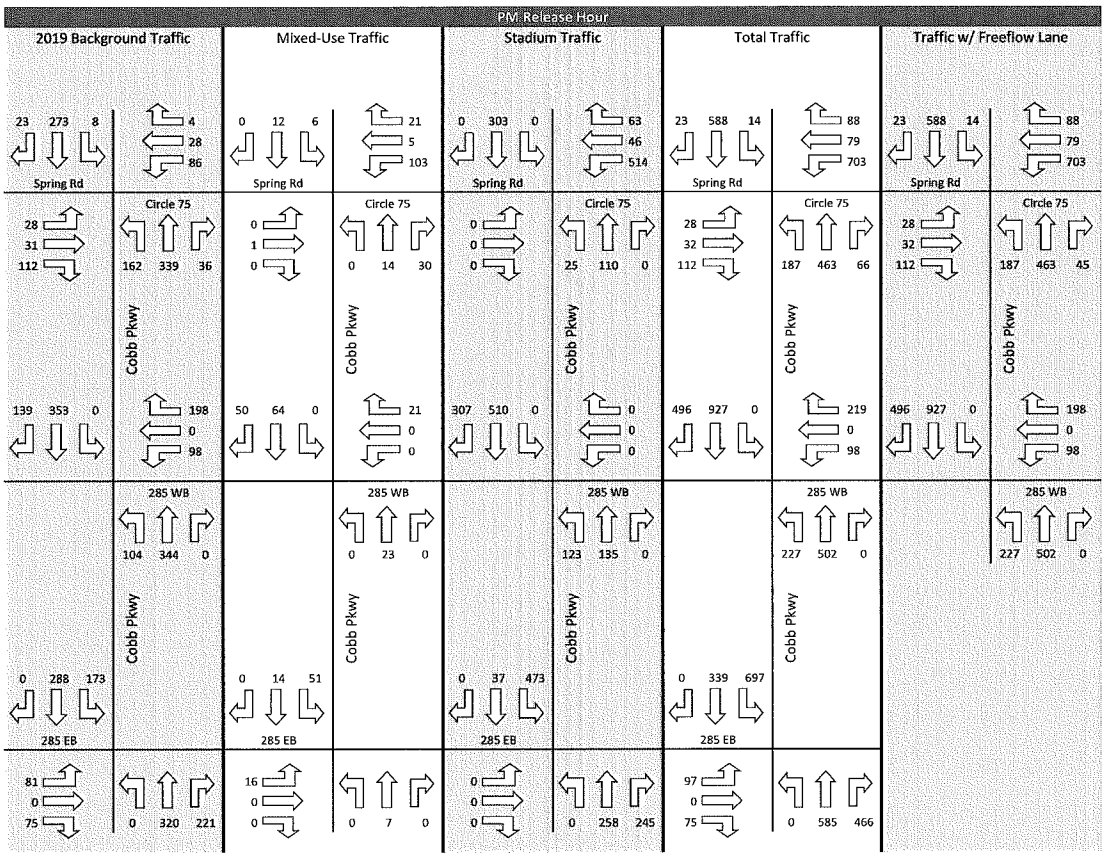
Existing Lane Configuration

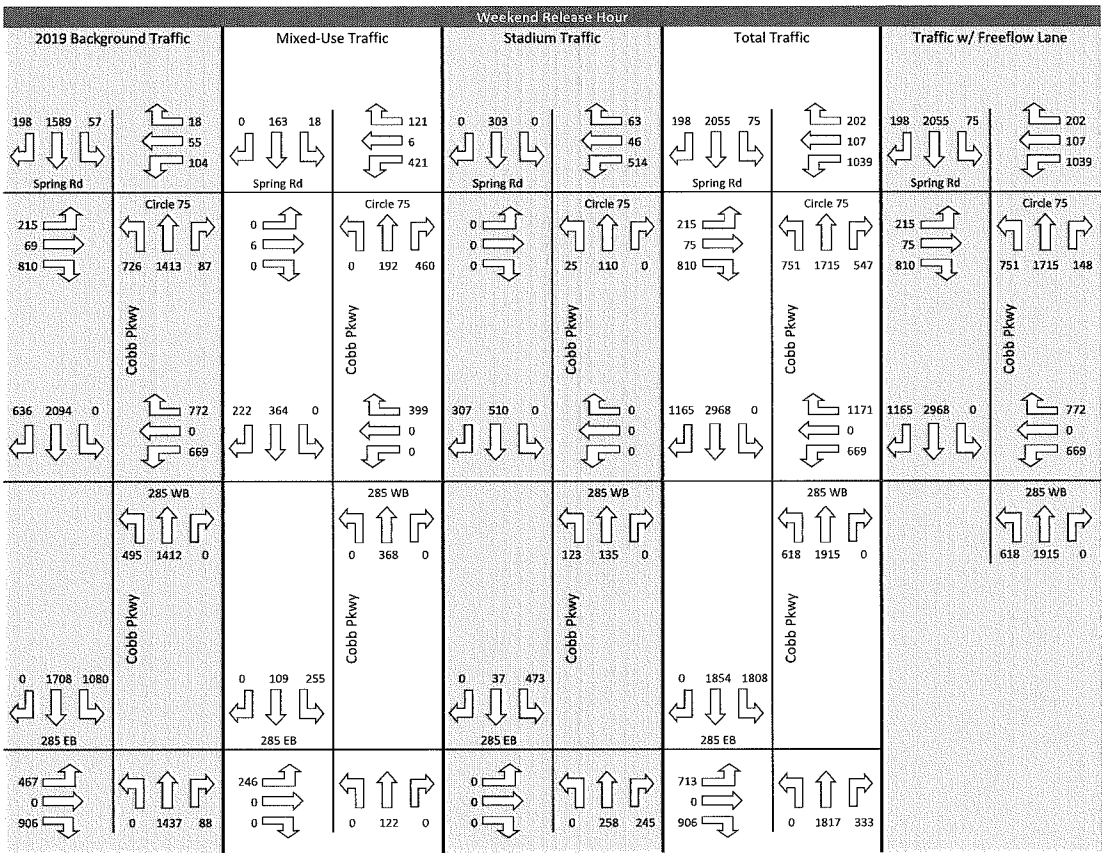


Proposed Lane Configuration



Attachment D:
2019 PM and Weekend Release Hour Turning Movement Counts


PM Release Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
23 273 8
4 28 86
0 12 6
21 5 103
0 303 0
63 46 514
23 588 14
88 79 703
28 31 112
162 339 36
0 1 0
0 14 30
0 0 0
25 110 0
28 32 112
187 463 66
139 353 0
198 0 98
50 64 0
21 0 0
307 510 0
0 0 0
496 927 0
219 0 98
104 344 0
0 23 0
123 135 0
227 502 0
0 288 173
0 14 51
0 37 473
0 339 697
81 0 75
0 320 221
16 0 0
0 7 0
0 0 0
0 258 245
97 0 75
0 585 466
28 32 112
187 463 45
198 0 98
227 502 0
496 927 0


Weekend Release Hour
2019 Background Traffic
Mixed-Use Traffic
Stadium Traffic
Total Traffic
Traffic w/ Freeflow Lane
Spring Rd
Circle 75
Cobb Pkwy
285 WB
285 EB
198 1589 57
18 55 104
0 163 18
121 6 421
0 303 0
63 46 514
198 2055 75
202 107 1039
215 69 810
726 1413 87
0 6 0
0 192 460
0 0 0
25 110 0
215 75 810
751 1715 547
636 2094 0
772 0 669
222 364 0
399 0 0
307 510 0
0 0 0
1165 2968 0
1171 0 669
495 1412 0
0 368 0
123 135 0
618 1915 0
0 1708 1080
0 109 255
0 37 473
0 1854 1808
467 0 906
0 1437 88
246 0 0
0 122 0
0 0 0
0 258 245
713 0 906
0 1817 333
215 75 810
751 1715 148
772 0 669
618 1915 0
1165 2968 0

Attachment E:
Synchro PM and Weekend Peak Hour and Release Hour Queue Reports

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	157	266	593	589	607	157	1060	2385	928	148	1647
v/c Ratio	0.79	1.27	0.42	2.96	2.99	0.44	0.97	0.74	0.90	0.62	0.86
Control Delay	94.9	207.8	23.5	916.8	929.9	7.3	62.0	32.9	22.9	84.0	61.7
Queue Delay	0.0	0.0	0.0	1.6	1.6	0.0	6.8	8.2	38.0	0.0	0.0
Total Delay	94.9	207.8	23.5	918.4	931.5	7.3	68.9	41.0	60.9	84.0	61.7
Queue Length 50th (ft)	170	~368	192	~1115	~1152	0	566	524	458	78	405
Queue Length 95th (ft)	#296	#568	247	#1351	#1389	35	m421	m356	m186	119	445
Internal Link Dist (ft)		761			507			581			489
Turn Bay Length (ft)	320					200	450		250	380	
Base Capacity (vph)	199	209	1400	199	203	356	1094	3239	1033	257	1917
Starvation Cap Reductn	0	0	0	0	0	0	38	838	172	0	0
Spillback Cap Reductn	0	0	47	19	19	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	1.27	0.44	3.27	3.30	0.44	1.00	0.99	1.08	0.58	0.86

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	813	1988	508	2566	2256	954
v/c Ratio	1.15	2.49	0.79	0.70	0.60	0.88
Control Delay	137.3	698.6	88.9	2.7	49.1	40.6
Queue Delay	1.3	0.0	4.2	0.6	0.5	40.1
Total Delay	138.5	698.6	93.0	3.3	49.6	80.8
Queue Length 50th (ft)	~512	~1498	270	68	582	845
Queue Length 95th (ft)	#587	#1496	m263	m80	m480	m684
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	708	798	643	3686	3772	1084
Starvation Cap Reductn	0	0	77	646	912	202
Spillback Cap Reductn	122	2	0	176	874	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.39	2.50	0.90	0.84	0.79	1.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1012	554	2773	592	1028	1772
v/c Ratio	1.16	1.00	0.98	0.80	1.03	0.47
Control Delay	140.4	94.4	57.9	21.2	83.1	1.2
Queue Delay	0.0	0.0	3.0	0.0	28.2	0.3
Total Delay	140.4	94.4	60.9	21.2	111.3	1.5
Queue Length 50th (ft)	~442	~293	738	238	~601	0
Queue Length 95th (ft)	#477	#382	708	401	m#663	m0
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	873	552	2835	737	997	3797
Starvation Cap Reductn	0	0	0	0	324	1209
Spillback Cap Reductn	5	0	51	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.17	1.00	1.00	0.80	1.53	0.68

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	182	187	918	358	356	170	759	2008	1117	144	2146
v/c Ratio	0.86	0.85	0.70	1.69	1.66	0.45	0.80	0.66	1.07	0.58	1.06
Control Delay	97.6	94.8	31.8	366.9	353.2	7.2	50.0	20.8	46.4	76.9	89.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	13.9	0.0	0.0
Total Delay	97.6	94.8	31.8	366.9	353.2	7.2	50.0	21.3	60.3	76.9	89.2
Queue Length 50th (ft)	186	191	362	~536	~529	0	311	371	~889	71	~576
Queue Length 95th (ft)	#332	#333	421	#665	#660	19	m227	m314	m388	109	#697
Internal Link Dist (ft)		761			507			581			489
Turn Bay Length (ft)	320					200	450		250	380	
Base Capacity (vph)	212	221	1419	212	215	378	1075	3039	1048	274	2022
Starvation Cap Reductn	0	0	0	0	0	0	0	488	49	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.85	0.65	1.69	1.66	0.45	0.71	0.79	1.12	0.53	1.06

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	1051	1890	544	2334	2849	943
v/c Ratio	1.31	2.10	0.99	0.66	0.77	0.85
Control Delay	193.6	527.8	57.8	41.3	16.9	9.6
Queue Delay	0.7	0.0	0.0	48.4	1.6	8.9
Total Delay	194.3	527.8	57.8	89.7	18.5	18.6
Queue Length 50th (ft)	~680	~1268	281	879	308	92
Queue Length 95th (ft)	#774	#1321	m#299	m828	m187	m111
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	801	898	549	3525	3721	1111
Starvation Cap Reductn	0	0	0	2043	648	147
Spillback Cap Reductn	87	3	0	159	529	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.47	2.11	0.99	1.57	0.93	0.98

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1085	1095	1671	83	1435	2362
v/c Ratio	1.31	2.06	0.65	0.17	1.24	0.62
Control Delay	193.6	511.9	41.2	7.6	146.3	7.3
Queue Delay	0.3	0.0	48.3	0.0	0.4	3.6
Total Delay	193.9	511.9	89.5	7.6	146.7	10.8
Queue Length 50th (ft)	~481	~925	357	2	~919	309
Queue Length 95th (ft)	#574	#1078	394	51	m#890	m290
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	831	531	2569	488	1155	3813
Starvation Cap Reductn	0	0	0	0	105	1336
Spillback Cap Reductn	37	0	1063	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.37	2.06	1.11	0.17	1.37	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	249	593	965	388	1060	2385	306	148	1647
v/c Ratio	0.83	0.59	0.47	0.94	0.51	0.78	0.89	0.40	0.62	1.02
Control Delay	98.4	73.2	27.5	78.7	44.6	56.5	48.2	15.7	84.0	85.9
Queue Delay	0.0	0.0	0.0	24.5	0.0	0.0	7.9	0.0	0.0	0.0
Total Delay	98.4	73.2	27.5	103.2	44.6	56.5	56.1	15.7	84.0	85.9
Queue Length 50th (ft)	181	132	211	356	144	370	661	86	78	~445
Queue Length 95th (ft)	#312	182	247	#429	197	m384	m695	m119	119	#607
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	210	420	1400	1029	760	1590	2678	770	257	1621
Starvation Cap Reductn	0	0	0	0	0	0	287	0	0	0
Spillback Cap Reductn	0	0	1	109	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.59	0.42	1.05	0.51	0.67	1.00	0.40	0.58	1.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	813	1293	508	2566	2256	954
v/c Ratio	0.68	0.99	0.95	0.87	0.77	0.89
Control Delay	47.7	70.9	79.2	2.0	28.3	22.3
Queue Delay	0.2	38.2	0.0	17.5	6.9	6.1
Total Delay	47.9	109.1	79.2	19.5	35.2	28.5
Queue Length 50th (ft)	373	567	262	41	454	753
Queue Length 95th (ft)	415	#629	m250	m33	m468	m870
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	1201	1307	536	2955	2923	1077
Starvation Cap Reductn	0	0	0	463	281	91
Spillback Cap Reductn	58	132	0	61	634	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	1.10	0.95	1.03	0.99	0.97

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1012	554	2773	592	1028	1772
v/c Ratio	1.05	0.92	1.03	0.81	1.02	0.48
Control Delay	103.0	76.3	73.1	20.2	70.6	2.6
Queue Delay	20.7	0.0	0.0	0.0	31.6	0.3
Total Delay	123.6	76.3	73.1	20.2	102.2	2.8
Queue Length 50th (ft)	~406	288	~807	206	~584	42
Queue Length 95th (ft)	#441	#355	#747	371	#725	72
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	966	600	2685	735	1008	3702
Starvation Cap Reductn	0	0	0	0	312	1046
Spillback Cap Reductn	65	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.12	0.92	1.03	0.81	1.48	0.67

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	236	133	918	640	244	759	2008	199	144	2146
v/c Ratio	0.79	0.22	0.81	0.75	0.36	0.91	0.82	0.29	0.54	0.98
Control Delay	79.6	55.9	43.9	64.8	18.3	77.1	41.7	10.9	74.0	66.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	10.4
Total Delay	79.6	55.9	43.9	64.8	18.3	77.1	42.0	10.9	74.0	76.9
Queue Length 50th (ft)	227	60	422	211	32	248	463	25	71	512
Queue Length 95th (ft)	#382	95	530	229	58	#333	527	m74	107	#582
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	298	596	1136	931	729	831	2451	690	389	2194
Starvation Cap Reductn	0	0	0	0	0	0	98	0	0	0
Spillback Cap Reductn	0	0	1	0	0	0	0	0	0	95
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.22	0.81	0.69	0.33	0.91	0.85	0.29	0.37	1.02

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	1051	887	544	2334	2849	943
v/c Ratio	0.96	0.74	0.95	0.76	0.94	0.88
Control Delay	68.4	45.8	83.2	5.6	35.2	15.8
Queue Delay	0.0	0.0	0.0	10.5	44.8	3.0
Total Delay	68.4	45.8	83.2	16.1	80.0	18.8
Queue Length 50th (ft)	521	314	267	145	442	121
Queue Length 95th (ft)	#618	362	m#286	m84	m510	m161
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	1098	1204	572	3084	3017	1066
Starvation Cap Reductn	0	0	0	758	75	61
Spillback Cap Reductn	0	0	0	14	835	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.74	0.95	1.00	1.31	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	1085	1095	1671	83	1435	2362
v/c Ratio	0.74	1.25	1.06	0.25	1.19	0.75
Control Delay	51.6	163.5	94.7	13.4	125.4	9.3
Queue Delay	0.4	0.0	0.0	0.0	2.3	8.2
Total Delay	51.9	163.5	94.7	13.4	127.8	17.5
Queue Length 50th (ft)	341	~728	~470	6	~878	134
Queue Length 95th (ft)	395	#881	#540	68	m#963	m146
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	1463	874	1579	327	1201	3169
Starvation Cap Reductn	0	0	0	0	447	791
Spillback Cap Reductn	81	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	1.25	1.06	0.25	1.90	0.99

Intersection Summary

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Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	31	36	124	703	167	196	487	47	15	650
v/c Ratio	0.15	0.09	0.20	0.40	0.14	2.58	0.23	0.07	0.29	0.30
Control Delay	53.9	52.1	9.0	32.4	13.9	772.2	27.9	0.5	77.0	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.9	52.1	9.0	32.4	13.9	772.2	27.9	0.5	77.0	36.5
Queue Length 50th (ft)	24	14	1	157	23	~100	60	0	6	104
Queue Length 95th (ft)	56	32	31	194	48	#155	91	0	19	129
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	204	408	632	1765	1210	76	2119	629	52	2139
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.09	0.20	0.40	0.14	2.58	0.23	0.07	0.29	0.30

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
7: Cobb Parkway & 285 WB On/285 WB Off

4/15/2015

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	115	233	244	540	1030	551
v/c Ratio	0.22	0.31	0.44	0.14	0.25	0.49
Control Delay	49.4	7.0	57.2	0.4	10.1	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay	49.4	7.0	57.2	0.4	10.1	4.9
Queue Length 50th (ft)	44	0	112	2	51	56
Queue Length 95th (ft)	69	25	157	2	78	79
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	528	752	554	3872	4178	1122
Starvation Cap Reductn	0	0	0	0	0	146
Spillback Cap Reductn	0	0	0	0	65	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.31	0.44	0.14	0.25	0.56

Intersection Summary

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	115	89	962	274	704	342
v/c Ratio	0.25	0.26	0.37	0.44	0.54	0.08
Control Delay	56.3	12.2	27.2	5.6	43.0	1.3
Queue Delay	0.0	0.0	0.0	0.0	14.7	0.0
Total Delay	56.3	12.2	27.2	5.6	57.7	1.3
Queue Length 50th (ft)	32	0	139	0	297	6
Queue Length 95th (ft)	50	23	155	59	356	7
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	460	340	2582	620	1307	4126
Starvation Cap Reductn	0	0	0	0	592	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.26	0.37	0.44	0.98	0.08

Intersection Summary

Queues
3: Cobb Parkway & Spring Road/Circle 75 Parkway

4/15/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	236	82	890	1267	376	785	1805	156	79	2347
v/c Ratio	0.96	0.17	0.87	1.66	0.60	1.03	0.63	0.20	0.39	0.89
Control Delay	109.9	57.8	51.6	338.6	38.1	96.5	21.0	5.9	73.2	50.5
Queue Delay	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay	109.9	57.8	52.1	338.6	38.1	96.5	21.0	5.9	73.2	50.6
Queue Length 50th (ft)	233	37	425	~636	104	~295	273	18	39	530
Queue Length 95th (ft)	#406	65	528	#641	137	m#333	m276	m40	67	569
Internal Link Dist (ft)		761			507		581			489
Turn Bay Length (ft)	320					450		250	380	
Base Capacity (vph)	247	495	1023	765	624	765	2870	785	389	2642
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	17	0	0	0	0	0	0	23
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.17	0.88	1.66	0.60	1.03	0.63	0.20	0.20	0.90

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	769	887	679	2104	3262	1280
v/c Ratio	1.16	1.17	1.19	0.56	0.82	1.15
Control Delay	139.9	138.8	148.2	3.7	27.1	88.6
Queue Delay	0.0	0.0	0.0	2.3	33.5	0.2
Total Delay	139.9	138.8	148.2	6.0	60.5	88.8
Queue Length 50th (ft)	~457	~427	~418	121	467	~748
Queue Length 95th (ft)	#555	#510	m#360	m60	m460	m#695
Internal Link Dist (ft)				310	581	
Turn Bay Length (ft)		390				500
Base Capacity (vph)	663	756	572	3729	3973	1112
Starvation Cap Reductn	0	0	0	1438	394	48
Spillback Cap Reductn	0	0	0	0	925	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.16	1.17	1.19	0.92	1.07	1.20

Intersection Summary

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m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	759	964	1928	312	1944	1994
v/c Ratio	0.65	1.36	1.22	0.70	1.38	0.57
Control Delay	55.1	208.6	153.9	24.7	204.6	5.6
Queue Delay	2.4	0.0	0.0	0.0	0.8	0.7
Total Delay	57.4	208.6	153.9	24.7	205.4	6.3
Queue Length 50th (ft)	240	~668	~610	101	~1305	97
Queue Length 95th (ft)	287	#819	#678	263	m#1359	m100
Internal Link Dist (ft)			780			310
Turn Bay Length (ft)	250	250				
Base Capacity (vph)	1164	711	1577	443	1407	3474
Starvation Cap Reductn	0	0	0	0	263	990
Spillback Cap Reductn	269	0	15	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.85	1.36	1.23	0.70	1.70	0.80

Intersection Summary

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Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

POND

Pond & Company, Inc.

Architects
Engineers
Planners

3500 Parkway Lane
Suite 600
Norcross, GA 30092

P 678.336.7740
F 678.336.7744
www pondco.com

MEETING MINUTES

Project : **Cobb Parkway at I-285/Spring Road**
Pond Project No. : 1150272
Meeting : Concept Team Meeting
Meeting Location : Cobb County DOT – Conference Room X
Meeting Date : 4/24/15

Minutes prepared by : Bryon Letourneau
Prepared on : April 27, 2015

Copies: File
Attendees

Attendees:

Name	Company/Dept./Branch	email	phone
Jim Wilgus	Cobb DOT	Jim.Wilgus@cobbcounty.org	
Chris Pruitt	Cobb DOT	Chris.Pruitt@cobbcounty.org	770.528.1670
James Hudgins	Cobb DOT	James.Hudgins@cobbcounty.org	770.420.6658
Kelly Patrick	Cobb DOT	Kelly.Patrick@cobbcounty.org	
Drew Raessler	Cobb DOT	Drew.Raessler@cobbcounty.org	
Eric Meyer	Cobb DOT	Eric.Meyer@cobbcounty.org	
Andy Rikard	Cobb DOT	Andy.Rikard@cobbcounty.org	
David Muller	Cobb DOT	David.Muller@cobbcounty.org	
Eric Randall	City of Smyrna	ERandall@smyrnaga.gov	
Chris Rideout	Croy Engineering	CRideout@croyengineering.com	
David Webb	Croy Engineering	DWebb@croyengineering.com	
Ron Osterloh	Pond & Company	OsterlohR@pondco.com	678.336.7740
Nina Gailey	Pond & Company	GaileyN@pondco.com	678.336.7740
Graham Malone	Pond & Company	MaloneG@pondco.com	678.336.7740
Bryon Letourneau	Pond & Company	letourneaub@pondco.com	678.336.7740

PURPOSE OF MEETING:

This meeting was held to discuss the Concept for the Cobb Parkway at I-285/Spring Road project, Cobb County Project No. X-2430.

MEETING PROCEEDINGS:

Pond began the meeting discussing the overall project layout (see attached) and Pond's understanding of the current project.

The Concept Layout presented was generally accepted by the attendees. There were some questions regarding the widening along Circle 75 Parkway that was discussed further.

Cobb DOT upon addition of the Circle 75 Parkway widening to the project provided a proposed Right of Way line from the surrounding development consultant and asked Pond to keep the roadway within this line, if possible. Upon the traffic analysis of the intersection of Circle 75 Parkway with Cobb Parkway it was determined that additional turn lane storage is necessary along Circle 75 Parkway. The optimal lane configuration for Circle 75 Parkway as shown in the current Concept encroaches more on the northern parcels along this stretch. This result will require Cobb County DOT to approach the surrounding development consultant to negotiate the newly

proposed right of way line. Pond is tasked with creating a color aerial graphic showing the originally proposed right of way line with the new proposed right of way line superimposed for use in the negotiations.

Two overhead sign bridges will be needed along the I-285 Westbound Exit Ramp to designate the lanes approaching Cobb Parkway. Pond is tasked with coordinating with AECOM to ensure that theses overhead signs are visible upon completion of the Pedestrian Bridge over I-285 currently under design.

Three overhead sign bridges will likely be necessary along westbound Circle 75 Parkway to designate lane assignments. One will likely be located east of the proposed Heritage Court intersection and two more between Heritage Court and Cobb Parkway. As suggested by GDOT at a previous meeting, the westbound lanes along Circle 75 will be marked with the appropriate Interstate shield pavement markings to further demarcate lane assignments. The sign bridges in this area should be decorative to match the new development around the Braves Stadium. Cobb DOT will secure the specifications for the decorative treatments.

Drew Raessler asked Pond to investigate the possibility of removing the currently proposed split-phasing of the traffic signal at the Circle 75 Parkway and Cobb Parkway intersection. Drew suggested that a lead-lag signal phasing may be more effective. Pond will investigate both scenarios.

Due to the expected height of the proposed wall east of Cobb Parkway south of the Circle 75 Parkway a specially designed retaining wall will be necessary in this area. Cobb DOT suggested that Pond investigate the Gravix Wall System and provided contact information for the product.

The large power transmission pole in the southeast corner of the Cobb Parkway at Circle 75 Parkway intersection is in conflict with the proposed continuous flow right turn lane onto Circle 75. This pole will need to be relocated as a part of this project. This is a significant construction concern. Cobb DOT will schedule a utility coordination meeting in the next two weeks with the utility companies that have major facilities on this project.

After discussion of pedestrian activity in the area, it was decided that due to the free flow right turn lane from the I-285 Westbound Exit Ramp to Circle 75 Parkway, pedestrians should be actively excluded from the east side of Cobb Parkway. Cobb DOT is currently designing a Pedestrian Bridge over I-285 just east of the project that will serve pedestrians in the area.

The right turn lane storage along the I-285 WB Exit Ramp is proposed to be extended as a part of this project. The grading for this turn lane extension will impact the parcels to the north of the Exit Ramp. There is an AGL Easement along the southern edge of these parcels. Andy Rikard is to contact AGL to ascertain if this easement has been abandoned.

There is an existing AT&T telecommunications vault in the southeast quadrant of the Cobb Parkway at Circle 75 Parkway intersection that may need to be manholed as a part of this project. Andy Rikard is to coordinate with AT&T regarding treatment of this affected facility.

Upon completion of the Signal Modification Permit Applications, Pond is to submit the two packages to Cobb DOT for submittal to GDOT.

The GDOT Encroachment Permit Package, once complete, is to be submitted by Pond to Cobb DOT for review and comment prior to Pond's submission to GDOT District 7.

The Cobb Parkway east shoulder north of the Circle 75 Parkway intersection should be widened to accommodate a 10' sidewalk set at the back of Right of Way and a correspondingly wide grass strip to the new proposed curb and gutter along Cobb Parkway.

It was decided that a right turn lane will not be necessary at the existing right in right out just north of the Cobb Parkway and Circle 75 Parkway intersection.

The existing drop inlet at approximately STA 108+46 Right will converted to a manhole in the travel lane to avoid extending the existing buried box culvert in the area.

The currently shown Heritage Court at Circle 75 Parkway intersection is in the correct location and cannot be moved.

The medians along Cobb Parkway in the area of the project will be landscaped where feasible.

The proposed retaining wall east of Cobb Parkway between the I-285 WB Exit Ramp and Circle 75 Parkway will specify decorative facing.

The existing split roadway profile along Circle 75 Parkway just east of the Cobb Parkway intersection was discussed. It was decided that Pond is to hold the southern edge of pavement elevation along Circle 75 Parkway and provide a 6% cross slope to the north. Pond will also need to make sure this scheme does not adversely affect the Colonial Pipeline facility in the area. Cobb DOT will provide the Colonial Pipeline information it has to Pond to assist in this profile development.

Pond is planning to submit Preliminary Plans to Cobb DOT for review and comment on 5/29/15.

POND

Pond & Company, Inc.

Architects
Engineers
Planners

3500 Parkway Lane
Suite 600
Norcross, GA 30092

P 678.336.7740
F 678.336.7744
www pondco.com

ACTION ITEMS:

Pond & Company:

1. Develop aerial layout for Circle 75 Parkway widening showing the Pond proposed right of way line in comparison to the development consultant's proposed right of way line.
2. Coordinate with AECOM regarding sign bridge location on the I-285 WB Exit Ramp in relation to the proposed Pedestrian Bridge over I-285.
3. Investigate possible Traffic Signal Timing for the Cobb Parkway at Circle 75 Parkway intersection. Split Phasing vs. Lead-Lag.
4. Contact Gravix to discuss the possibilities of using their retaining wall system on the project.

Cobb County DOT:

1. Secure decorative treatment specifications for traffic signal poles and sign bridges for the project.
2. Schedule a Utility Coordination meeting with the owners of the major utility facilities on the project.
3. Andy Rikard to contact AGL regarding the status of the AGL easement on the southern edge of the parcels just north of the I-285 WB Exit Ramp.
4. Andy Rikard to coordinate with AT&T to determine the treatment of the affected telecommunications vault in the southeast corner of the Cobb Parkway at Circle 75 Parkway intersection.
5. Provide Colonial Pipeline information to Pond for use in the design of Circle 75 Parkway near Cobb Parkway.

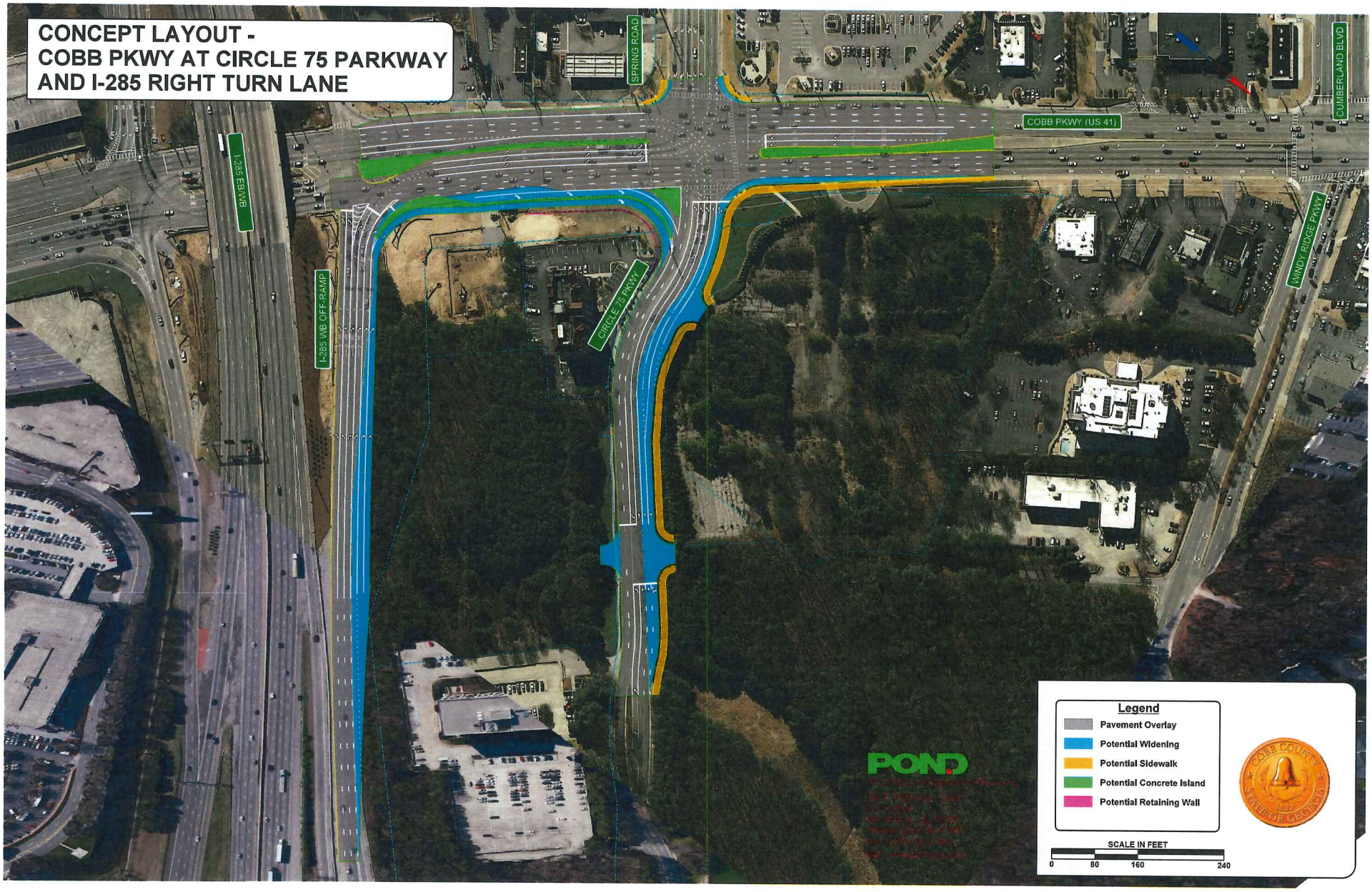
ATTACHMENTS:

Concept Layout

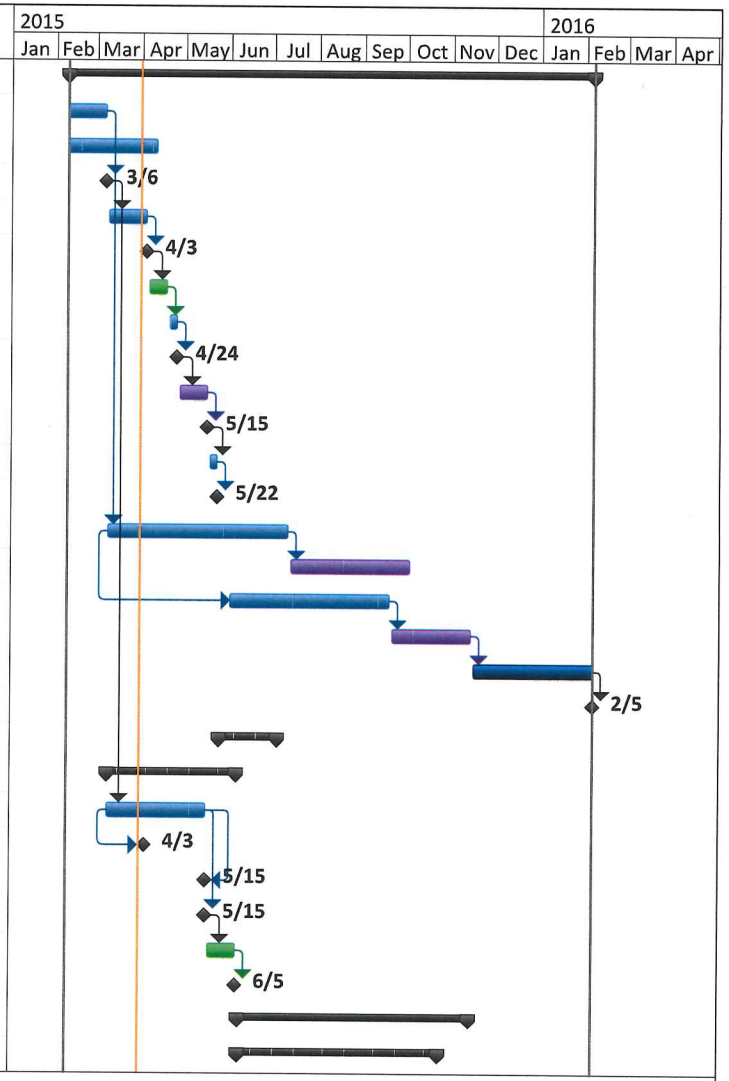
The above is the understanding of the meeting by the representatives of Pond & Company. Please direct any questions or comments to Bryon Letourneau at the above contact information.

END OF MEETING MINUTES

ADDITIONAL COMMENTS:


CONCEPT LAYOUT -
COBB PKWY AT CIRCLE 75 PARKWAY
AND I-285 RIGHT TURN LANE
SPRING ROAD
COBB PKWY (US 41)
CUMBERLAND BLVD
I-285 EB/WB
I-285 WB OFF-RAMP
CIRCLE 75 PKWY
WINDY RIDGE PKWY
POND
Legend
Pavement Overlay
Potential Widening
Potential Sidewalk
Potential Concrete Island
Potential Retaining Wall
SCALE IN FEET
0
80
160
240

ID	Task Name	Duration	Start	Finish
1	**PHASE I: CONCEPT DEVELOPMENT AND ENVIRONMENTAL**	**260 days**	**Mon 2/9/15**	**Fri 2/5/16**
2	DEVELOP CONCEPT	20 days	Mon 2/9/15	Fri 3/6/15
3	DEVELOP TRAFFIC REPORTS	45 days	Mon 2/9/15	Fri 4/10/15
4	INITIAL CONCEPT TEAM MEETING	0 days	Fri 3/6/15	Fri 3/6/15
5	PREPARE CONCEPT REPORT	20 days	Mon 3/9/15	Fri 4/3/15
6	SUBMIT CONCEPT REPORT TO CCDOT	0 days	Fri 4/3/15	Fri 4/3/15
7	CCDOT REVIEW OF CONCEPT REPORT	10 days	Mon 4/6/15	Fri 4/17/15
8	INCORPORATE CCDOT COMMENTS	5 days	Mon 4/20/15	Fri 4/24/15
9	SUBMIT CONCEPT REPORT TO GDOT	0 days	Fri 4/24/15	Fri 4/24/15
10	GDOT CONCEPT REPORT REVIEW	15 days	Mon 4/27/15	Fri 5/15/15
11	CONCEPT TEAM MEETING	0 days	Fri 5/15/15	Fri 5/15/15
12	INCORPORATE GDOT COMMENTS	5 days	Mon 5/18/15	Fri 5/22/15
13	FINAL CONCEPT REPORT APPROVAL	0 days	Fri 5/22/15	Fri 5/22/15
14	SPECIAL STUDIES (HIST., ARCH., ECOL., AIR/NOISE)	90 days	Mon 3/9/15	Fri 7/10/15
15	SPECIAL STUDIES REVIEW	60 days	Mon 7/13/15	Fri 10/2/15
16	PREPARE PROGRAMMATIC CATEGORIAL EXCLUSION (PCE)	80 days	Mon 6/1/15	Fri 9/18/15
17	GDOT REVIEW/ADDRESS COMMENTS/RESUBMIT	40 days	Mon 9/21/15	Fri 11/13/15
18	FHWA REVIEW/ADDRESS COMMENTS/RESUBMIT	60 days	Mon 11/16/15	Fri 2/5/16
19	FHWA APPROVAL OF PCE	0 days	Fri 2/5/16	Fri 2/5/16
20	**PHASE II: DATABASE PREPARATION**	**30 days**	**Mon 5/25/15**	**Fri 7/3/15**
22	**PHASE III: PRELIMINARY PLANS**	**65 days**	**Mon 3/9/15**	**Fri 6/5/15**
23	PRELIMINARY PLANS PRODUCTION	50 days	Mon 3/9/15	Fri 5/15/15
24	UTILITY COORDINATION - FIRST SUBMITTAL	0 days	Fri 4/3/15	Fri 4/3/15
25	UTILITY COORDINATION - SECOND SUBMITTAL	0 days	Fri 5/15/15	Fri 5/15/15
26	SUBMIT PRELIMS TO CCDOT FOR REVIEW	0 days	Fri 5/15/15	Fri 5/15/15
27	CCDOT REVIEW OF PRELIMS	15 days	Mon 5/18/15	Fri 6/5/15
28	PRELIMINARY FIELD PLAN REVIEW	0 days	Fri 6/5/15	Fri 6/5/15
29	**PHASE IV: RIGHT OF WAY PLANS**	**115 days**	**Mon 6/8/15**	**Fri 11/13/15**
35	**PHASE 5: FINAL PLANS**	**100 days**	**Mon 6/8/15**	**Fri 10/23/15**



Project: Cobb Pkwy Schedule
Date: Tue 3/31/15

Task		External Milestone		Manual Summary Rollup	
Split		Inactive Task		Manual Summary	
Milestone		Inactive Milestone		Start-only	
Summary		Inactive Summary		Finish-only	
Project Summary		Manual Task		Deadline	
External Tasks		Duration-only		Progress	